

The Impact of the Environment on Health

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Increasingly science is providing evidence linking the disease burden of people with exposure to toxins in their environments. The quality of one's health is determined by physical, chemical, biological, social, and psychological problems in the environment. This article provides an overview of the current science on how environmental pollution is impacting upon the chronic disease burden in people, how toxic chemicals are traveling globally and entering the food chain, and the impact of changes in climate upon one's health. **Key words:** *biomonitoring studies, body burden, chemical contaminants, climate change, environmental pollution, toxins*

THE concern of nurses is for people's health—its promotion, its maintenance, its restoration. The healthy lives of people depend ultimately on the health of Planet Earth—its soil, its water, its oceans, its atmosphere, its biological diversity—all of the elements which constitute people's natural environment. By extension, therefore, nurses need to be concerned with the promotion, maintenance, and restoration of the health of the natural environment, particularly with the pollution, degradation and destruction of that environment being caused by human activities.¹

On a daily basis, nurses witness the impact of the environment on the health status of individuals, families, communities, and populations. The American Nurses Association,² in its *Code of Ethics for Nurses* (Provision 8), encourages nurses to be aware of the health needs of patients and broader health concerns such as environmental pollution.

According to the World Health Organization, environmental health "comprises those aspects of human health, including quality of

life, that are determined by physical, chemical, biological, and social and psychological problems in the environment. It also refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially adversely affect the health of present and future generations."³ Environmental pollution can occur from unsafe water; improper sanitation; damaged watersheds; deforestation; pesticides and insecticides; tainted food crops; contaminated animals and fish; cleaning products; solid wastes and landfills; incineration; mining drainage; gas flares; oil refineries; building and flooring products; paints and solvents; and medical waste including disinfectants, detergents, laboratory chemicals, plastics including intravenous tubing and bags, red bag waste, sharps disposal, pharmaceuticals, and solid, liquid, and infectious waste. Causes of environmental pollution can be the result of "scarcity of essential things" such as "clean air and water, healthy soil and forests, safe and comfortable shelter, and safe working conditions" and "excess of harmful things" such as trash, toxic chemicals, pollution, and junk food.⁴

Science is linking our disease burden with chemical contaminants in the environment. Exposure to these chemicals is increasing the chronic disease burden of each of us.⁵ Some of the new findings in environmental health include the following⁵:

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1. Chemical exposure at incredibly small levels can impact hormonal systems and disrupt the body's normal development.
2. Fetuses and young children are more vulnerable to chemical exposure.
3. Chemical exposure by individuals at important stages in human development can cause changes that are seen only in later life when the health impact manifests itself.
4. Chemicals can interact in synergistic ways in our bodies contributing to their impact on our health by causing disease or exacerbating an existing health problem.

Toxic chemicals can impact at levels that were once considered to be safe and are only now being recognized as toxic and destructive to health.⁵ Three modern-time examples of how toxic pollution seriously impacts the health and lives of people are (1) the Love Canal, (2) the Bhopal disaster, and (3) mining among the Dineh:

1. The Love Canal in Niagara Falls, New York, was originally meant to connect 2 rivers but was used by a chemical company as a waste pit, and after 21 000 tons of toxins were dumped, it was filled in with soil and sold for \$1 to the city for development. Homes and schools were built along the canal site and after a while, serious health problems—miscarriages, birth defects, developmental disabilities, skin rashes and allergies, asthma and other breathing problems, and neurological defects—developed. The canal area is now an abandoned brownfield neighborhood.⁴
2. One night in 1984 in Bhopal, India, a pesticide factory in a poor neighborhood leaked thousands of tons of poison gas into the air; the warning system at the factory had been turned off. After 3 days, 8000 people died and over the next 20 years, 20 000 more people died from illnesses caused by the poison in their bodies. The children and grandchildren of those poisoned developed severe birth defects, reproductive and nervous system disorders until more

than 150 000 lives were impacted by the disaster caused by a “flipped switch.”⁴

3. In the western United States, Native American people known as the Dineh occupy land rich in uranium. In the 1940s, the tribe members were recruited to mine the uranium fields without proper education and safety precautions. The miners and their families developed illnesses and health problems related to radiation poisoning (miscarriages, birth defects, infertility, lung cancer, breathing problems, and severe neurological impairments); even the cattle and sheep near the mines sickened and died. It took the Dineh 50 years to have uranium mining banned from their lands.⁴

Environmental scientists are studying individuals' body burdens—the “amount of a particular chemical stored in the body at a particular time, especially a potentially toxic chemical in the body as a result of exposure can be the result of long- or short-term storage, for example, the amount of a metal in bone, the amount of a lipophilic substance such as polychlorinated biphenyls in adipose tissue, or the amount of carbon monoxide (as carboxyhemoglobin) in the blood.”⁶ Chemicals are introduced into our bodies through ingestion (eating and drinking), inhalation, and skin absorption. Whether one is harmed by exposure depends on kind and amount of the chemical in the exposure; length of the exposure; individual's age, body weight, and height; one's sex; and general state of health.⁴

The Louisville Charter for Safer Chemicals⁷ states that the current chemical burden on individuals is “unprecedented in human history.” More than 100 000 chemicals are used in energy production, manufacturing, and production of consumer products. Most of these chemicals are man-made, with 15 000 produced annually in quantities greater than 10 000 pounds and 2800 in quantities greater than 1 million pounds in a year. There has been very little testing of these chemicals for human health effects.⁸

Toxic chemicals have been proven or are suspected to cause many different illnesses

such as birth defects, reproductive health problems, endometriosis, cancers, asthma and other respiratory diseases, allergies, neurological disorders, skin conditions, and multiple chemical sensitivity or environmental illness. There are so many toxic chemicals in our home, work, and community environments that it is difficult, if not impossible, to know all the actual exposures or how the many combinations of exposures working together can affect our health.⁴ Health care workers are exposed to additional and increasingly dangerous list of toxic chemicals, pollutants, and environmental hazards—mercury, polyvinyl chloride, dioxin, di(2-ethylhexyl)phthalate, latex, glutaraldehyde, formaldehyde, pesticides, antineoplastic drugs, waste anesthetic gases, ionizing radiation, and lasers.⁹

Since toxic chemicals can travel globally through air, water, and food, our concern for the environmental impact of chemicals needs to be treated as a worldwide problem. Toxins can collect in human and animal fat and persist in some plants, easily entering and accumulating in the human food chain. It is particularly evident in fish transmission as smaller fish feed on toxic algae, with progressively larger fish eating smaller fish, resulting in the larger ones having greater and more toxic levels of accumulated contaminants. This is how the heavy metal mercury, as methyl mercury, can poison fish and affect humans who ingest the fish, with pregnant women and fetuses being particularly susceptible.

The world's environment is a reservoir for heavy metals (lead, mercury, cadmium, chromium), persistent organic pollutants (dioxins and furans), polychlorinated biphenyls and polybrominated diphenylethers (flame retardants), and radiation. The Environmental Protection Agency¹⁰ has stated that dioxins "are likely to be human carcinogens and are anticipated to increase the risk of cancer at background levels of exposure."

Increasingly, there are examples of disease burden within the United States that is particularly troubling. Some examples include the near doubling of asthma rates,¹¹

increasing rates of autism,¹² increasing rates of women's lifetime risk of breast cancer,¹³ and doubling of the incidence of hypospadias in male infants.¹⁴ The Centers for Disease Control and Prevention's biomonitoring studies indicate that 1 in 10 women have mercury blood levels that pose a threat of neurological damage to their fetus and the presence of heavy metals, dioxins, and pesticides in the blood, urine, and breast milk of the US population.¹⁵ The Centers for Disease Control and Prevention has measured 212 chemicals in people's blood or urine—75 of which have never before been measured in the US population. These new chemicals include acrylamide, arsenic, environmental phenols, including bisphenol A and triclosan, and perchlorate.¹⁵

The Environmental Working Group has been examining the effects of the buildup of industrial chemicals in our bodies from grandparents to babies still in the womb. Some of these studies have demonstrated the following:

1. In the umbilical cord blood of newborn babies, 287 chemicals were detected with an average of 200 chemicals in each newborn; 180 of the chemicals are known to cause cancer in humans and animals, 217 are toxic to the brain and nervous system, and 208 cause birth defects or abnormal development in animal testing.¹⁶
2. In a study of minority newborns, 9 out of 10 samples of cord blood tested positive for bisphenol A, an industrial petrochemical; it has been implicated in cancer, cognitive and behavioral impairments, endocrine system disruption, reproductive and cardiovascular abnormalities, diabetes, asthma, and obesity.¹⁷
3. In a study of 9 volunteers, none of whom worked with chemicals on the job or lived near an industrial facility, an average of 91 industrial compounds, pollutants, and other chemicals were found in the volunteers' blood and urine with a total of 167 chemicals; of these chemicals, 76 are known to cause cancer, 94 are toxic to brain and nervous system,

and 79 can cause birth defects or abnormal development.¹⁸

In 2006, Environmental Working Group, American Nurses Association, Health Care Without Harm, and the Environmental Health Education Center at the University of Maryland's School of Nursing conducted an online survey of 1500 nurses. The collected information demonstrated that nurses with frequent, long-term exposures (at least weekly, for at least 10 years) reported higher rates of cancer, asthma, difficulty conceiving, and nervous system problems than other nurses. Higher rates of developmental problems in their children were reported by the surveyed nurses.¹⁹

In 2009, Physicians for Social Responsibility, in conjunction with American Nurses Association and Health Care Without Harm, conducted the first ever research investigation into the chemicals in the bodies of physicians and registered nurses. It was discovered that the 20 health care participants had toxic chemicals linked with health care facilities in their bodies with each individual having at least 24 chemicals associated with chronic illnesses and physical disorders and 4 of the chemicals were on the Environmental Protection Agency's list of priority chemicals for future regulation.²⁰

In addition to the impact of toxic chemicals on the environment, there is increasing concern about the effect of climate change upon health. The World Health Organization believes that current changes in global climate can cause increases in temperature-related illnesses and death, injuries and illnesses due to extreme weather events, spread of infectious disease vectors, water-borne illnesses, and air pollution-related conditions.²¹ In *An Inconvenient Truth*, Al Gore²² discusses the world's recent nature hike through the Book of Revelations as he explores the impact of record-breaking heat waves, melting glaciers, drowning polar bears and hurricanes, typhoons, tornadoes, and tsunamis upon the environment.

These changes in climate can lead to "worsening air pollution; heat-related illnesses; accidents and injuries from increased flooding,

storm surge, and extreme weather; threatened quantity and quality of water supplies; and a rise in vector-transmitted diseases such as malaria, West Nile, and dengue fever."²³ Health Care Without Harm²³ has stated that "health professionals are going to be on the front lines of any climate-related disaster, responding to public health impacts. Overall, the need to treat illness and disease due to climate-related changes in our environment will continue to increase. It is clear how climate events can impact the environment, just as toxic chemicals do, resulting in negative health outcomes."

It is important as global citizens and nurses that we do whatever we can to effect environmental change that will benefit ourselves and our families, our patients and health care facilities, our communities, and our planet. We must work to avoid toxins in our daily lives, homes, and workplaces; avoid transferring contaminants from our health care facilities to our homes; organize our communities and workplaces to prevent pollution; learn to reduce, reuse, recycle, and renew; force vendors and companies that produce contaminating products to participate in reduction, cleanup and substitution efforts; and lobby governments worldwide to set better and enforceable safety standards. We can gain strength in our effort by remembering our successes: Getting the lead out in gasoline resulted in decreased lead levels in children, the Needlestick Safety & Prevention Act (2000) reduced needlestick injuries to health care workers by half, closure of 700 medical waste incinerators in the United States led to reductions in dioxin emissions and body burdens, standards limiting glutaraldehyde exposure resulted in the development of substitutions by manufacturers, and the banning of the use of DDT resulted in the bald eagle's removal from the endangered species list. Finally, we can gain encouragement from the advice of Helen Caldicott: "Only if we understand the beauty of nature will we love it, and only if we become alerted to learn about the planet's disease processes can we decide to live our lives with a proper sense of ecological responsibility."²⁴

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