What We Know

NEW SCIENCE LINKING
OUR HEALTH AND
THE ENVIRONMENT

Acknowledgements
The Collaborative on Health and the Environment (CHE) constructed this toolkit using the materials and wisdom of many individuals and organizations. This booklet was written by Heather Sarantis. Susan West Marmagas and Charlotte Brody at CHE/Commonweal provided extensive input. Diane Blacker edited this booklet. Ted Schettler (Science and Environmental Health Network), Sarah Jansen (Natural Resources Defense Council), Tracey Woodruff (University of California at San Francisco), Alexandra Gorman (Women's Voices for the Earth) and Ellen Dorsey (The Heinz Endowments) served as reviewers, but CHE/Commonweal is responsible for the final document. Special thanks to The Heinz Endowments for their partnership and financial support.

To learn more, go to the Women's Health and the Environment website at www.womenshealthandenvironment.org.

April 2007
Printed with soy-based ink on New Leaf Reincarnation paper
(100% recycled, 50% post-consumer content, processed chlorine free).
Design by half-full (www.half-full.org).

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NEW SCIENCE LINKING OUR HEALTH AND THE ENVIRONMENT

Women play many roles. We are friends, sisters, daughters, girlfriends, partners, wives, workers and mothers. We are caretakers and breadwinners. We are advocates for our families, children, aging parents and communities.

Women also are leaders in protecting people's health—whether it is taking a sick child's temperature, making sure there is nutritious food in the house or working toward a healthy environment.

This booklet explains the science linking women's health to the environment. It describes the factors that affect whether contaminants will harm our health. It also highlights the effects of contaminants at each stage of a woman's life—including the potential life-long health effects from being exposed to contaminants in the womb.

The information presented here can be scary. There is reason to be concerned, but there are also many opportunities to improve the world we live in. We can use safer products around our homes, and we can hold government and industry accountable for protecting us from environmental contaminants. The other booklets in this series, *What You Can Do: Everyday Actions to Protect Your Health* and *What We Can Do: Community Efforts to Protect Our Health* provide ideas for taking action. All three booklets are available at www.womenshealthandenvironment.org/toolkit.

Helpful Definitions

ENVIRONMENTAL CONTAMINANTS
A broad range of substances that may harm people's health, including synthetic chemicals and chemical compounds, heavy metals (used in products or industrial processes) and radiation. The term also includes air pollution, which is a mixture of particles and chemicals from different sources, including industrial pollution, vehicle emissions (such as cars, diesel trucks and buses, freight ships and others) and tobacco smoke. Sometimes referred to as simply "contaminants" in this document.

CHEMICALS
More than 82,000 synthetic chemicals are registered for use in manufacturing and industry. Only ten percent of those chemicals have been tested for their effects on human health. Approximately 2,800 of these are considered "high-production volume" chemicals, or those produced in amounts of 1 million pounds or more per year in the United States.

Environmental Contaminants and Our Health

Health problems and disabilities such as asthma, birth defects, cancer, diabetes and infertility affect more than 100 million men, women and children, about one-third of the U.S. population. Scientific research shows that exposure to environmental contaminants may increase a person's risk for these and other health concerns. Pregnancy and early childhood are especially vulnerable times, but exposure throughout our lives may harm us.

We can be exposed to these contaminants through household products, the food we eat, air pollution from vehicles or factories, hazardous waste sites and other sources. We can find contaminants in our homes, communities, schools and workplaces. With thousands of chemicals and other contaminants in use, more research is needed to understand how all these environmental contaminants affect human health. But there is enough evidence to know we need better public policy to prevent exposing people to contaminants that are—or may be—harmful to people's health.

If the annual average concentration of fine particulate air pollution could be reduced, thousands of premature deaths, heart attacks, strokes and bypass surgeries across the country could be prevented.

Pollution in People

One way scientists are getting a better understanding of how environmental contaminants are impacting people is through biomonitoring or "body burden" studies. These studies include testing people's urine, breast milk, blood and other biological samples to see if they contain contaminants.

Although biomonitoring cannot explain how people were exposed to contaminants or whether these exposures will lead to any health problems, the test results document the number and volume of contaminants that end up in our bodies. Some body burden findings include:

Lead in children: For the past three decades, the Centers for Disease Control and Prevention (CDC) have conducted body burden studies of lead, which may cause learning disabilities and other problems. The most recent studies found that lead levels in children have declined, indicating that efforts to reduce childhood exposure to lead in gasoline and other products have had success. More work is needed, especially to protect children who live in homes contaminated with lead from paint or other sources.

Flame retardants in breast milk: A biomonitoring study by the Environmental Working Group (EWG) found that women in the United States have the world's highest levels of flame retardants in their breast milk. Flame retardants, which are widely used in furniture, electronic equipment and other consumer products, may be associated with learning and memory problems and behavior changes. Several states have banned the use of certain flame retardants based on these biomonitoring studies.

Contaminants in newborns: A study by EWG and Commonweal of ten newborns' umbilical cord blood showed an average of 200 industrial chemicals and pollutants. Overall, the study detected 287 out of the 413 chemicals that were surveyed. This result showed that not even the mother's placenta can keep environmental contaminants from crossing into her child.

Some Women's Health Concerns That May Be Linked to Environmental Contaminants

There is growing evidence that some of the health concerns that especially affect women may be linked to environmental contaminants. Some examples include:

Breast Cancer: A woman has a one in eight chance of having breast cancer in her lifetime, but less than one in 10 of those women are born with a genetic predisposition for the disease. Radiation (including medical radiation) and longer lifetime exposures to the hormone estrogen, and perhaps also to progesterone, can increase a woman's risk for breast cancer. Industrial chemicals that act like the hormones estrogen and progesterone may be adding to women's breast cancer risk. Other factors may also play a role.

Heart Disease: Cardiovascular disease remains the leading cause of death in the United States, and the No. 1 cause of death for women. Some of the environmental factors that increase the risk for heart disease include smoking and secondhand smoke, exposure to some metals (such as arsenic, lead or mercury) and air pollution.

Endometriosis: Endometriosis affects about 1 in 10 women in the United States, and nearly 40 percent of women with infertility appear to have endometriosis. In this disease, the inner lining of the uterus, called the endometrium, is found outside the uterus in the abdominal cavity or on the ovaries or fallopian tubes. Endometriosis may cause pain during menstruation or intercourse. Some contaminants that may increase risk for endometriosis include dioxins, polychlorinated biphenyls (PCBs) and radiation.

Fertility Challenges: According to a recent national survey, 12 percent of the reproductive age population in the United States, or 7.3 million couples, report difficulty conceiving or carrying a pregnancy to term, or both of these problems. The largest reported increase in infertility is in women under age 25. Although there is still much to learn about environmental factors, exposures that may interfere with fertility include cigarette smoke, DES exposure in the womb (some women took the drug DES to prevent miscarriages from the 1930s to 1971) and health challenges such as endometriosis. Exposure to solvents such as formaldehyde, toluene, perchloroethylene (dry cleaning fluid) and pesticides also has been linked to fertility problems in women.

To learn more about which environmental contaminants may increase risk for these and other health conditions, see the Collaborative on Health and the Environment's Toxicant and Disease database: http://database.healthandenvironment.org.

Diabetes: There has been a 46 percent increase in women with diabetes since the mid-1990s. Nutrition and obesity are significant risk factors for diabetes. Research is showing that environmental contaminants may also increase risk for diabetes. For example, exposure to estrogen-like compounds is associated with the development of obesity, therefore increasing risk of developing diabetes. Arsenic, and to a lesser extent dioxin, have both been associated with higher rates of adult onset of Type II diabetes. A recent animal study showed that chronic exposure to low levels of Bisphenol A (found in polycarbonate plastic and food can linings) causes insulin resistance in adult mice, a phenomenon linked to Type II diabetes. Furthermore, new studies are finding that exposure to PCBs and organochlorine pesticides may also increase risk for diabetes.

Health Disparities Due to Race and Ethnicity

Health concerns and disease can affect all people, but they do not affect all people equally. For example, children of color suffer disproportionate burdens of disease with potential environmental aspects, including asthma, learning and developmental disabilities and cancer. African American women are more likely to die from heart disease, stroke or cancer than women of any other race.

Health Factors: A Complex Web

A woman's health is a balance of many complex factors. Exposure to environmental contaminants is just one of them. There is no formula that can determine the exact effects of exposure to different contaminants. The effect depends on the risk associated with that exposure and a person's overall health and susceptibility. This illustration shows just some of the factors at work.

To protect our health, it is important to do the positive things where we have control, such as eating well, exercising, using healthier products and reducing stress. And then join the growing movement of women working to make sure the government does its job of protecting all of us from environmental contaminants.



Environmental Contaminants

It is impossible to make exact predictions of whether a person exposed to environmental contaminants will develop health problems. But some of the factors that influence the risk of being harmed by contaminants include:

Hazard of the Contaminant

Not all contaminants are equally hazardous. Adequate information about the health impacts of thousands of chemicals does not yet exist; yet it is clear that some contaminants are especially hazardous to human health and the health of other species. For example, mercury is widely understood to affect brain development, especially in the very young.

Dose of Exposure

For many years people assumed that contaminants were only harmful if people were exposed in high doses. But new research indicates that the question of dose is more complicated. Some contaminants are harmful at high doses, some at low doses, some at both high and low doses, but in different ways.

Timing of Exposure

Exposures to some contaminants early in life can influence health later in life. For example, early life exposure to chemicals that are hormonally-active (i.e. interfere with the hormone system), such as Bisphenol A, may cause puberty to happen earlier in life. Exposure to arsenic in the womb is tied to lung disease and cancer in adults.

Combinations of Exposures

Most of the research on the connection between health and contaminants is focused on exposure to one contaminant at a time. In reality, people are generally exposed to multiple contaminants at the same time through the variety of products we use, the food we eat, the emissions we are surrounded by and the contaminants that may be stored in our bodies for years.

Much more research is needed on how combinations of contaminants can affect our health, but smoking is one area where this kind of research has been done. The results are not good. For example, smokers exposed to asbestos have a markedly increased risk for lung cancer, much larger than the risk of lung cancer from just smoking or just asbestos exposure.

Nutrition

Good nutrition is important for children to grow strong and for all people to support their overall health. Studies indicate that poor nutrition may magnify the effect of environmental contaminants. For example, iron-deficient children may experience greater effects from lead exposure because they actually absorb and retain more lead. Additionally, iron-deficient kids may ingest more lead because they are more likely to live in lead-contaminated environments. When, like any normal child, they put their hands in their mouths, they are likely to swallow more lead-contaminated dust and dirt.

Stress

Stress comes in many forms, such as too many responsibilities, financial pressure or challenges in our relationships. Reducing stress is important for our overall health and being able to handle life's challenges—mental, physical or otherwise. Constant stress taxes the immune system and makes us more vulnerable to harmful influences on our health, such as environmental contaminants. Taking time to exercise, eat well and do things that make you happy can help reduce stress.

Pregnancy

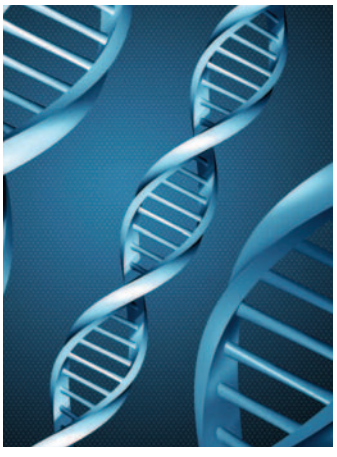
Events in a woman's reproductive cycle can affect her health. For example, women who have their first child after age 30 and women who never give birth have about a two- to three-fold increased risk of breast cancer compared to women who have their first child before age 20.

Exercise

Exercise is important for staying healthy. It builds strength, increases circulation and strengthens the immune system—all important things when fighting the everyday cold or resisting the effects of environmental contaminants. Plus it feels good and helps lift the spirits. However, care should be taken when exercising outdoors on poor air-quality days.

Social Support

Strong social support from friends, family and/or a supportive community can play an important role in a person's well-being and even help protect people against chronic illness. For example, people with a strong social network may be less likely to develop obesity and diabetes. One study found that the social support African American women received in their faith-based community helped them maintain healthier lifestyles.



Genetic Heritage

Each of us inherits our genes from our biological parents. Some of these genes determine how we look, such as eye color or face structure. Other genes make people more susceptible to developing some diseases. For example, people with inherited alterations in the genes called BRCA1 and BRCA2 (short for breast cancer 1 and breast cancer 2) have an increased risk for breast and ovarian cancer. But carrying these genes does not mean a woman will automatically develop such cancers.

WHAT WE KNOW

Each stage of a woman's life sets the path for her future health and possibly the health of her children. The previous section highlights the many factors that influence whether or not exposure to environmental contaminants will contribute to health problems. This section highlights how the timing of exposure may affect our health and the health of future generations.

Lifecycle and the Environment

In Utero

Before a baby is born, critical development happens in all organs and tissues, including the rapidly growing brain, reproductive and endocrine (or hormone) systems. What babies are exposed to in the womb may have long-term health effects.

- The risk for attention deficit disorder and learning disabilities can be increased if a fetus is exposed to certain contaminants. For example, there are some fish that pregnant women should avoid because they contain methylmercury, which can adversely affect brain development. But there are types of fish that pregnant women should eat because they are rich in important nutrients.
- Exposure to indoor and outdoor air pollutants (including secondhand smoke) has been linked to adverse birth outcomes, such as low birth weight and increased risk for developing asthma.
- Exposure to chemicals in the womb that affect the endocrine system may increase the risk of numerous types of cancer later in life. For example, animal studies indicate that pre-natal exposure to Bisphenol A (which is used in polycarbonate plastics, the lining of food cans and other products) may increase the risk of breast cancer later in life.

Infants & Children

More growth and development takes place in a baby's first year than at any other time. Early childhood is also an important period of development. The early years are a critical time to provide good nutrition and a healthy environment.

- Chemicals in secondhand smoke are very damaging to a young child's health. They have been linked to increased risk for sudden infant death syndrome, middle ear infections, lower respiratory tract illness, prevalence of wheeze and cough and worsening asthma.
- Once children can crawl, they are exposed to floor dust that may contain lead, flame retardants or other substances that may harm brain development.
- When it comes to eating, children are not just little adults. Health impacts from food contaminants such as pesticides or heavy metals can be greater because children consume more food per pound of body weight than adults and because childhood is such a vulnerable time of development.
- Children may also be exposed to pesticides and harmful cleaners at school.

Teens

Teenage years are also a time of rapid growth. Girls' bodies begin producing higher levels of estrogen and progesterone, their reproductive tract undergoes change to prepare for pregnancy and their breasts go through rapid development. All of these changes make their bodies vulnerable to environmental contaminants.

- Teens often begin using makeup and personal care products, many of which contain ingredients that may be harmful to their health. While the chemicals present in any one cosmetic product alone may not cause harm, teenagers, like adults, use on average more than 10 personal-care products every day.
- Each day, nearly 6,000 children under 18 years of age start smoking, and 2,000 of them will become regular smokers. Approximately 90 percent of smokers begin smoking before age 21. Studies indicate that when multiple factors are taken into account, such as the length of time a person has been a smoker and the amount she or he smokes, smoking during adolescence causes more damage than at other times, especially increasing the risk for lung cancer. Secondhand smoke may also increase risk for breast cancer, and developing breast tissue may be quite sensitive to environmental contaminants.

Early Adulthood

This is a time of adjusting to full-time jobs or other adult responsibilities. Finding ways to maintain good health habits while making the transition into adulthood is important, including eating well, maintaining or establishing an exercise routine and choosing healthier products around the home.

- Entering the workforce may entail being exposed to contaminants from toxic cleaners, chemicals used in manufacturing or other sources. Federal standards for occupational safety are often not strong enough and are not always well enforced. Workplace exposures may increase a woman's risk for many health concerns, such as cancer.
- Young women may be thinking of becoming a mother at some point in their lives, but exposures to chemicals even years before they try to have children may impact their ability to become pregnant and/or have a healthy, full-term child. For example, endometriosis, which may be caused by chemical exposures, can impair fertility. Occupational exposure to certain chemicals is also known to threaten a woman's ability to have a healthy child.

Pregnancy

In the words of Katsi Cook, a Native American midwife, a woman's body is the first environment. Whatever a pregnant woman is exposed to, her baby may also be exposed to; the placenta does not protect the fetus from environmental contaminants. Eating nutritious food, exercising and avoiding environmental contaminants when possible are especially important during pregnancy.

- Exposure to chemicals on the job when pregnant can be especially dangerous. For example, beauty salon workers and women working at dry cleaners may have a higher rate of miscarriage from contaminant exposures in the work place.
- Choosing healthier products around the house is especially important when a woman is pregnant. For example, studies have found that phthalates—chemicals used in vinyl plastic and some personal care products such as nail polish—may harm male babies' reproductive organs. Pregnant women also should avoid using indoor pesticides, which can increase the baby's risk for being born prematurely and harm its development in the womb.

Menopause

A woman's changing hormones during menopause can cause obvious effects like hot flashes and night sweats, but a lifetime of exposure to contaminants may affect the onset of menopause and have other affects on a woman's health.

- A woman's risk for cardiovascular disease, including coronary heart disease and stroke, may increase as a result of menopause because estrogen, which decreases during menopause, serves as protection from these problems. When this natural protection decreases over time, lifetime risk factors for cardiovascular disease such as exposure to environmental contaminants may be more pronounced.
- Menopause often accelerates bone disintegration which can release contaminants stored in the bone. For example, the release of lead stored in a woman's bones may impact her memory and her ability to think clearly.
- Chemical exposures throughout life may induce early or premature menopause and increase the risks of illness and death in the post-menopausal period.

Seniors

The likelihood of having a stroke, heart disease, cancer or most other illnesses, whether related to environmental contaminants or not, increases after age 65. The way a woman has treated her body her whole life and the environmental contaminants she has been exposed to can affect her health and well-being in her later years.

- It is normal for people's immune systems to grow weaker as they age, but a lifetime of exposure to environmental contaminants may further suppress an older woman's immune system.
- Many women become less active as they age, which can lead to spending more time indoors and increase the chance of being exposed to indoor air pollutants. Effects from smoking or using cleaners and pesticides can be magnified if most of a woman's time is spent indoors in a poorly ventilated room.
- Exposure to outdoor air pollution can also pose significant risk to older adults. For example, particle pollution and ozone (from car and other industrial emissions) may aggravate lung diseases.

What We Can Learn from Animals

In the 1960s, marine biologist and zoologist Rachel Carson changed the way Americans think about and protect the environment. By studying the effects of the pesticide DDT on animal populations, she warned us of the potential effects on human health. She broke new ground in 1962 when she published *Silent Spring*, which documented how birds' eggs were thinning due to DDT exposure, resulting in an alarming decrease in the bird's ability to reproduce. Her account of health concerns associated with pesticide use was one of the catalyzing moments for the environmental movement in the United States.

More than 40 years later, there is still plenty we can learn about environmental contaminants by monitoring animal populations in the wild. While what affects animals will not necessarily affect humans, the effects of contaminants on animal health certainly raises important concerns.

Frogs: Researchers have found evidence that atrazine—the most commonly used herbicide in the United States and probably in the world—can cause hermaphrodism (having both male and female reproductive organs) in frogs in the laboratory and may be responsible for the same impacts seen in frogs in the wild. Atrazine is widely used on corn and soybean fields in the United States and contaminates drinking water supplies.

Alligators: Studies of alligators in a Florida lake contaminated with DDT and other organochlorine pesticides in the 1980s found the males' penises were on average 25 percent smaller than normal. These alligators, at the top of the lake's food chain, ate fish that store the breakdown products of DDT. These byproducts accumulated in the alligators' bodies and caused changes in the hormonal system.

Birds: Hundreds of bird deaths have been reported from toxic fumes produced from normal household use of Teflon pans and products. According to the Environmental Protection Agency, perfluorooctanoic acid (PFOA), one of the key compounds used in Teflon, is very persistent in the environment and can be found in the blood of the general U.S. population. Studies indicated that PFOA causes developmental and other adverse effects in laboratory animals.

Polar Bears: Studies indicate that polar bears are threatened by chemicals accumulating in the environment. Initial studies indicate that polychlorinated biphenyls (PCBs) and other chlorine-based chemicals may be causing polar bears' ovaries and testicles to shrink, which may interfere with their ability to reproduce.

Learning about all the ways that environmental contaminants can impact health can be a little overwhelming. But there's good news. First, the human body is amazingly resilient. Doing your best to stay healthy through eating nutritious food and getting exercise helps your body stay strong. Second, as the other booklets in this series will show, there are proactive things we can do as individuals and as a community to reduce our exposures to environmental contaminants and improve the health of people and the planet we share.

For further details, go to www.womenshealthandenvironment.org.

This booklet was developed based on extensive research, using peer-reviewed, published literature. Full scientific documentation for the information in this booklet is available on our website, at www.womenshealthandenvironment.org/toolkit.

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