

16 Harm from Toxic Chemicals

In this chapter:	page
Story: Toxic pollution at Love Canal	320
How toxic chemicals harm us	321
How chemicals harm children	322
Reproductive health problems	325
Cancer	327
Lung (breathing) problems	330
Chronic bronchitis	331
Asthma	331
Asbestosis	332
Nerve problems	332
Skin problems	332
Multiple chemical sensitivity	333
Our chemical body burden	333
Toxic mixtures	334
How toxics move through the environment	335
Activity: Deadly links	336
Heavy metals	337
Mercury poisoning	338
POPs	340
Radiation	342
Story: Organizing against radiation poisoning	344
Healing toxic injuries	345
Sambhavna Clinic	345

Harm from Toxic Chemicals



With the growth of industry and industrial farming over the past century, toxic chemicals have become a part of our daily lives. Most of these chemicals came into use with little understanding of the harm they cause to people and the environment.

We may be aware of these chemicals because we work with them, or because we can see and smell the pollution they cause around us. Factories, **oil refineries**, mines, and vehicles produce smoke and fumes that make people cough and choke. Waterways near industrial areas and large farms are often full of ugly, smelly waste. Petroleum production, chemical spills, and dumping sites contaminate water, soil, and air, often in ways that we can see and smell.

Other times, pollution cannot be seen or smelled. Some chemicals travel far from where they are used. They move through the air and water, in the foods we eat, and in the bodies of people, animals, and fish. Many chemicals used in ordinary products such as plastic bottles or motor vehicles, are so much a part of everyday life we do not even think about the ways they are dangerous.

Toxic pollution at Love Canal

Love Canal is a neighborhood in Niagara Falls, New York, USA. Love Canal was named after William Love, the man who began digging a canal to connect two rivers. The canal was never completed. Instead, a chemical company used the unfinished canal as a waste pit for 21,000 tons of toxic chemicals. Once the canal was full, the company covered it with soil and then sold the land to the city for one dollar, with the condition that the company was not responsible for any health problems that might arise.

Over the years, homes and a school were built next to the buried waste. Before long, people living in Love Canal began to have serious health problems. Lois Gibbs, one of the residents, knew something was wrong. “We knew there were too many miscarriages, too many birth defects, too many nervous system problems, and too much asthma and other breathing problems among us,” she said.

Mrs. Gibbs organized the community to demand a government investigation into these problems. When the government found toxic chemicals leaking into the ground around people’s homes, the community demanded money from the government to relocate all the residents. The residents were moved, but not before many of them suffered serious health problems. Today, an empty neighborhood and many people suffering lifelong illnesses are reminders of the dangers of toxic waste at Love Canal.

Lois Gibbs went on to fight against the harm caused by toxic pollution in other places. Her work helped pressure the US government to pass laws requiring companies to clean up their toxic wastes. Most importantly, Mrs. Gibbs helped people believe they have the power to stand up to the chemical industry, demand a healthy environment, and win! In her book *Dying from Dioxin*, she wrote:

We can blame the victim and get everybody to stop eating milk, fish and meat, and stop breastfeeding their babies. Or we can explore how people became powerless as the corporations became powerful. We have to discuss why our government protects the right to pollute more than it protects our health.



How Toxic Chemicals Harm Us

Whether or not a person will be harmed by toxic chemicals, and the kind of health problem that may be caused, depends on many things:

- what kinds of chemicals and the amounts he or she is exposed to
- how long the **exposure** lasts
- his or her age, body weight, height, and sex
- his or her general state of health at the time of the exposure

The danger from toxic chemicals is strongest at times when our bodies are growing or changing rapidly:

- when a baby is forming in the womb
- when a child is young and growing quickly
- when a teenager's (adolescent's) body is going through rapid changes
- when an older person's body slows down and is less able to filter poisons

The effects of toxic chemicals on a person may be severe, such as serious birth defects or cancer. Other effects may be harder to see, such as difficulty learning, slow growth, allergies, difficulty having children, and more frequent illness.

It is often difficult to know whether a certain health problem was caused or was made worse by toxic chemicals. Although toxic chemicals have been proven to cause many different illnesses, because we are exposed to so many chemicals at so many different times, proving that one particular exposure was responsible for an illness is difficult. But many illnesses are more common in places where people are regularly exposed to toxic chemicals.

Even very small amounts cause harm

Traditionally, doctors and scientists follow the rule, "the dose makes the poison." This means that more of a substance has a stronger effect, and less of it has a weaker effect. For example, poisons such as arsenic or cyanide are only toxic if a person eats too much of them. Even most medicines, like aspirin, are helpful when taken in small amounts, but can be harmful in large amounts.

But even very small amounts of some toxic chemicals can be very harmful. Some chemicals, such as **POPs** and **PCBs**, are not safe in any amount (see pages 340 to 342).

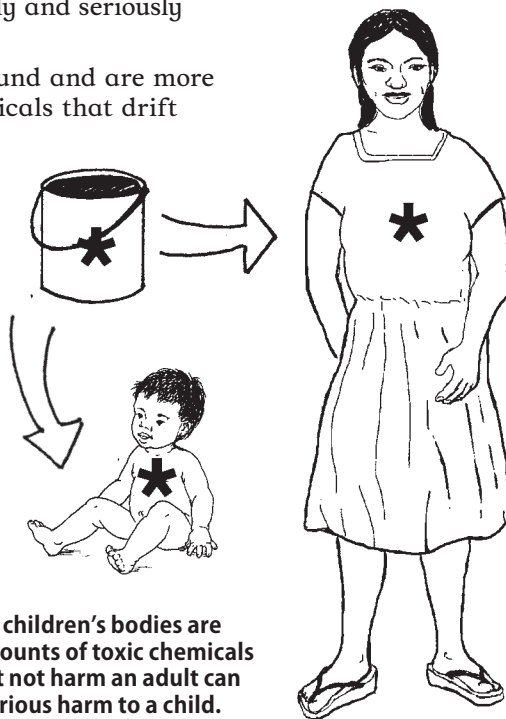


Every member of this family is affected by the chemical factory in their town — some more, some less.

How Chemicals Harm Children

Children, especially babies, are more easily and seriously harmed by chemicals than adults.

- Young children are closer to the ground and are more likely to eat, breathe, or touch chemicals that drift close to and collect on the ground.
- Children breathe much faster than adults and can get sick more easily from air pollution.
- Children often put their hands, toys, and other things in their mouths, and so are more likely to eat things that will harm them.
- Some parts of the body that protect adults from toxics are not yet well-developed in babies and children.
- When a baby's organs are developing, they are more vulnerable to damage from chemicals.



Because children's bodies are smaller, amounts of toxic chemicals that might not harm an adult can cause serious harm to a child.

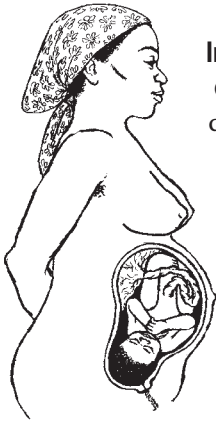
Toxics at different stages of children's growth

When the body is growing and changing quickly — during infancy, childhood, and adolescence — even very small amounts of chemicals can cause long-lasting and harmful changes in children's bodies.

Before conception

If the reproductive systems or **genes** of the mother or father are harmed by chemicals, babies can be affected even if the exposure happened before the baby was conceived.





In the womb

Chemicals already in the mother's body can be passed to a developing baby during pregnancy. For example, a woman who was exposed to lead as a child may still have lead in her bones. When she is pregnant, the lead is passed to the baby in her womb.

Many toxic chemicals that a pregnant woman may be exposed to, such as PCBs, lead, mercury, and insecticides can pass through the **placenta** into the growing fetus and cause harm.

Cigarette smoke, drugs, and alcohol can also harm a baby in the womb and should be avoided during pregnancy as well.

Birth to 2 years

A baby's skin and digestive system allow more chemicals to pass into the baby's body.

Some chemicals that a mother is exposed to can also collect in her breast milk and pass to the baby during breastfeeding. Toxics can also pass to babies in contaminated water used to mix formula and artificial milks. Breast milk is still the best food for a baby. Instead of avoiding breastfeeding to keep harmful chemicals out of babies, women are organizing to keep toxic chemicals out of breast milk.



Breast is best!

Infants and toddlers put everything in their mouths. This makes it easy for them to swallow harmful substances.

2 years to 12 years

When children begin going to day care (creche) or school, they may be exposed to many new chemicals, for example, if their schoolyards are sprayed with pesticides. Children who work shining shoes, scavenging through waste dumps, or in other ways to make money are often exposed to toxic chemicals. Besides causing illness, toxics can also harm a young person's ability to learn.



Children exposed to toxics may learn slowly, be irritable and restless, or show other signs of slow development.

12 to 18 years old

Adolescence (teen age) is a time of fast physical growth and change caused by **hormones** (see page 325). Toxic exposures can seriously harm a young person's ability to have healthy children later.

Birth defects

Birth defects are caused by damage to a person's genes. Because genes are passed from parents to children, harm from toxic chemicals may affect not only the person exposed to a toxic, but that person's children and the children's children. Not all birth defects are caused by toxic chemicals, but birth defects are more common in areas where industry uses or produces toxic chemicals or wastes. Birth defects can take many forms, some very mild (such as a birth mark) and others very severe (such as when the brain does not grow).

If your child is born with birth defects

If your child is born with birth defects, you may feel overwhelmed and uncertain about how you will care for your child. You are not alone!

Recognize your emotions. Parents experience shock, denial, grief, and even anger. Allow yourself to mourn the loss of the healthy child you thought you would have. Talk about your feelings with people who can understand and support you.

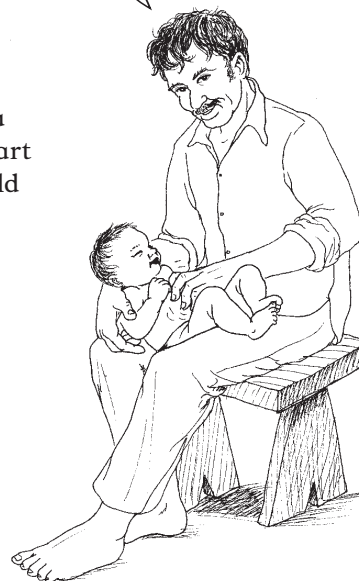
Seek community support. Ask your health worker or a social worker if they know other parents in the area who have children with the same condition. Join or start a support group with other parents. You and your child may discover a large and caring community.

Celebrate your child. Remember to let yourself enjoy your child the same way any parent would — by cuddling, playing, and watching the child grow and develop in his or her own way. Share your joy with family and friends.

Learn with your child. Seeking information about birth defects can be empowering, as can experiencing the changes the child goes through as he or she grows.

Physical exercises may help. Many disabilities can improve with the use of exercises and other methods. (To learn about physical exercises and other ways of helping children with birth defects and other disabilities, see the Hesperian books *Disabled Village Children*, *Helping Children Who Are Blind*, and *Helping Children Who Are Deaf*.)

Within and outside your community, there are people and resources to help you.



Reproductive Health Problems

Toxic chemicals can damage our ability to give birth to healthy children. Reproductive health problems affect women of childbearing age most, but they can also affect men and women at any time in their lives.

Some chemicals cause miscarriages or **sterility** (inability to have children) in men or women. They do this by interfering with **hormones**, the natural chemicals the body makes to control growth and other processes such as women's monthly bleeding and reproduction or men's production of sperm. Other chemicals act just like hormones when they get into our bodies. They can confuse our natural hormones by sending false signals. For this reason, these chemicals are sometimes called **hormone disruptors**.



How reproductive hormones work

Female hormones called estrogen and progesterone cause the changes in a girl's body known as puberty. They cause her ovaries to release one egg every month, stop her monthly bleeding during pregnancy, and after childbirth they cause her breasts to make milk. Hormones also determine how the baby grows inside its mother's womb.

Toxic chemicals disrupt hormones

Chemicals that are hormone disruptors can cause girls to start monthly bleeding early, have irregular bleeding, or have no bleeding at all. Disrupting the normal functions of hormones can also cause women to have a pregnancy start growing outside the womb, a very dangerous problem that can kill the woman.

Even small amounts of some chemicals, such as PCBs, dioxins, and some plastics (see pages 323 and 340), can cause serious damage to reproductive health. Many of these chemicals cannot be seen or smelled. They may not cause problems at the time of exposure, but still cause serious health problems many years later or in the next generation.

The health of future generations depends on protecting ourselves today.



Endometriosis

Endometriosis is a serious illness that causes the lining of the womb to grow outside of the womb. No one is sure what causes endometriosis. But because it is so common in industrial areas and places with a lot of pollution, one of its causes may be industrial pollution. Endometriosis can be very painful. Endometriosis can also make it difficult to get pregnant.

Signs

The main signs of endometriosis are pain during monthly bleeding and pain in the lower back and abdomen. Other signs are:

- heavy monthly bleeding or bleeding from the vagina at other times
- pain during sexual intercourse
- painful bowel movements, often with diarrhea or constipation
- bloating, vomiting, nausea, lower back pain, and tiredness

These could all be signs of other health problems. To know if it is endometriosis or some other serious illness, see a trained health worker right away.

Many health workers, however, are not familiar with endometriosis, so if you have several signs of this illness and a health worker tells you that you do not have endometriosis, seek out another health worker's opinion if you can.

Prevention and treatment

You may be able to use birth control pills to reduce the pain and heavy or irregular bleeding. Speak with a health worker. You can also reduce pain by taking medications such as ibuprofen. See a health book such as *Where Women Have No Doctor* for ways to treat pain.

For some women, changing what they eat seems to help reduce pain and signs of this illness. Since endometriosis is caused by problems with estrogen, avoid foods containing estrogen or estrogen-like substances, such as:

- meat and dairy products from animals that have been given hormones or that have been fed with grains that contain pesticides.
- vegetables and fruits that have been sprayed with pesticides.
- soybeans and foods made from soy, peanuts, and other legumes.

It may also help to avoid foods that cause the body to produce more estrogen or estrogen-like effects, such as foods in the nightshade family (eggplant, potatoes, tomatoes, and peppers), and coffee, chocolate, tea, and cola drinks.

Some foods may help the body fight endometriosis, including:

- foods that contain fiber, such as whole grains, beans, and brown rice.
- foods with a healthy fat called Omega-3 fatty acids, such as walnuts, pumpkin seeds, salmon, and other fatty fish.
- dark green vegetables, cabbage, broccoli, cauliflower, sesame, figs, and almonds.

Cancer

Cancer is a serious illness that can affect many parts of the body. Cancer starts when some **cells** begin to grow very quickly in an abnormal way, causing growths (**tumors**). Sometimes, tumors go away without treatment. But many tumors get larger or spread, causing health problems in several parts of the body. This is cancer. Most growths do not become cancer, but some do. Once upon a time cancer was unusual. Today it is very common.

What causes cancer?

One cause of the increase in cancer throughout the world is the increasing amount of industrial pollution and toxic chemicals in our environment and in our bodies. The increasing number of cancers in people living in or near highly polluted areas should lead our governments to act quickly to protect people's health. Cancer could be reduced by better regulating the kinds and amounts of chemicals industries are permitted to use, how they are used, and how they are disposed of.

Several types of cancer are known to be caused by toxic chemicals. These include cancer of the lungs, bladder, liver, breast, brain, blood (**leukemia**), multiple myeloma, and non-Hodgkin's lymphoma.



Warning signs or a test showing something may be wrong should not be ignored. See a health worker for advice and treatment right away.



Not all cancers are caused by industrial pollution. But where there is industrial pollution, there is cancer.

People exposed to toxic chemicals over a long time have a greater risk of getting these cancers than people with little or no toxic exposures. Knowing about their risk may help them get treatment early.

Finding and treating cancer early

Finding cancer early can often save a person's life, because the person can get treatment before the cancer spreads. Some warning signs of cancer are tiredness, chronic weight loss, lumps, and pain in the body. These can be signs of other illnesses as well. One way to find out if a person has cancer is to have a test that takes a few cells from the affected part of the body. Someone trained to recognize cancer examines the cells with a microscope.

Traditional and modern cancer treatments

Cancer affects people in different ways, and there is not one treatment that works for every person. Western medicine, Chinese medicine, Indian Ayurvedic medicine, and traditional medicines around the world all have treatments and ways of promoting better health for people with cancer. Unfortunately, none of them has a cure that works every time.

The best cancer treatments promote general health and well-being and involve the person in her own treatment. When seeking treatment, go to a doctor or other healer you know and trust.

The people who understand cancer best are those who have survived it. Every cancer survivor has her or his own story about what helped and what did not.

Cancer sometimes requires treatment with very strong medicines that cause hard to tolerate side effects. Cancer is rarely cured by just one kind of treatment, whether it is drugs, herbal remedies, diet, or other therapies. The best treatment combines physical treatments, such as cancer drugs or acupuncture, with promoting well-being by eating healthy foods. Emotional and spiritual support is also important, through support groups, counseling, prayer, or meditation.

When cancer cannot be cured

Some cancers can be cured but others cannot, especially if the cancer has spread to several parts of the body.

Often, when cancer is found late, there is no cure. Then it may be best to stay at home in the care of family. This time can be very difficult. A person with cancer should eat as well as possible, and get plenty of rest. Medicines for pain, anxiety, and sleeping problems can make a person with cancer more comfortable. Talking with someone close can help prepare for death, and plan for the family's future. Caregivers can sometimes find support and help providing care from a hospice (an organization that helps people in the last stages of life).



If you have cancer, it is helpful to seek the friendship and advice of others who have cancer or have survived it.

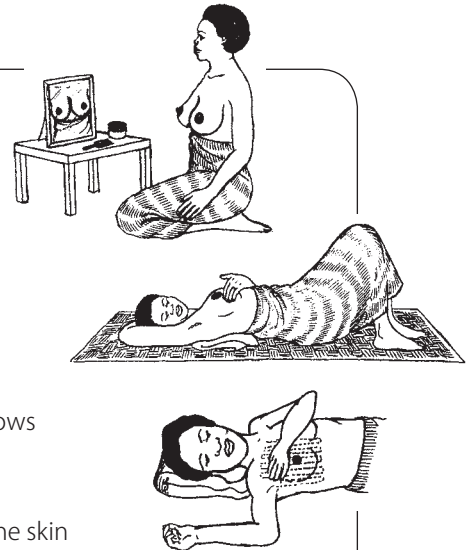
Breast cancer

Breast cancer has many causes, including exposure to toxic chemicals from pesticides, oil, cleaning products, and air pollution. If a woman's mother or sisters have had breast cancer, she may have a greater chance of getting it too. Breast cancer is most common in women over 50.

Breast cancer usually grows slowly, and is sometimes cured if found early. Women can watch for signs of breast cancer by examining their breasts themselves. Look for lumps or unusual discharge from the nipples. If a woman does this once a month, she will be familiar with how her breasts look and feel, and will notice any changes.

How to examine your breasts

- 1 Look at your breasts in a mirror. Raise your arms over your head. Look for any change in the shape of your breasts, or any swelling or changes in the skin or nipples. Then put your arms at your sides and check your breasts again.
- 2 Lie down. Keeping your fingers flat, press your breast and feel for any lumps.
- 3 Be sure to touch every part of your breast. It helps to use the same pattern every time, such as a spiral or rows of straight lines.



What to do if you find a lump

If the lump is smooth or rubbery, and moves under the skin when you push it with your fingers, do not worry about it. But if it is hard, has an uneven shape, and is painless, keep watching it, **especially if the lump is in only one breast and does not move even when you push it.** See a health worker if the lump is still there after your next monthly bleeding. This may be a sign of cancer. Also see a health worker if there is a discharge from the nipples that looks like blood or pus.

Lung (Breathing) Problems

Air pollution caused by burning fossil fuels (coal, oil, diesel, and natural gas) puts many toxic chemicals and harmful particles, like soot and smoke, into the air we breathe. Air pollution causes serious health problems. According to the World Health Organization, it kills 3 million people each year.

The two main parts of air pollution are a toxic gas called ozone, and **particulates**. Particulates are tiny bits of soot, smoke, metals, chemicals, dust, water, and rubber from tires. The smallest particles are the most harmful, because they get deepest into the lungs. Exposure to particulates can cause asthma and bronchitis attacks, and increases colds, flus, and other respiratory infections. Ozone is a strong irritant, causing a person's airways to tighten, forcing the lungs to work harder, and making existing lung problems worse. It can also cause headaches, wheezing, chest pain, nausea, and fatigue, and makes a person more vulnerable to lung infections, including tuberculosis or pneumonia.

Almost immediately, smoky or dirty air causes eyes to water, a dry throat, coughing, or wheezing. High levels of air pollution can also damage the lungs. Pollution can worsen already existing heart problems or lung disease, and cause the heart and lungs to work harder to supply oxygen to the body, causing difficulty breathing, fatigue, and chest pain.

Long-term exposure to polluted air makes:

- lungs age more quickly.
- chronic lung diseases develop, such as asthma, chronic bronchitis, emphysema, and lung cancer.
- people die earlier, most often from heart attack or stroke.

Air pollution is most dangerous for people who already have heart problems or lung diseases, pregnant women, children under 14 whose lungs are still developing, and people who work or exercise vigorously outdoors.

Prevention and Treatment

- Stop smoking tobacco.
- Avoid or reduce exposure to cooking smoke, automobile exhaust, and other chemical fumes.
- Prevent chest infections by hand washing and getting vaccinations.
- Quick-relief medicines for breathing (see asthma treatment) and cough syrup (see page 477) may be useful.

Some health problems from air pollution are not curable, such as cancers, emphysema, and asthma, although people can live with these problems for a long time. Getting away from polluted air can slow the progress of many lung diseases, but this is not possible for many people.

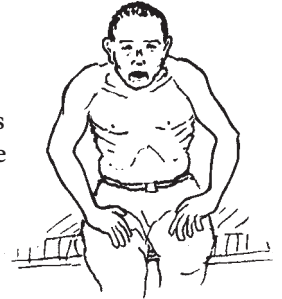
Chronic bronchitis

Chronic bronchitis is an inflammation (swelling) of the main airways in the lungs. Smoking or second-hand smoke (see page 355) from tobacco, air pollution, chemical fumes, and dust are the main causes of chronic bronchitis.

When a person's airways are irritated, a thick mucus forms and plugs them up, making it hard to breathe. Signs of chronic bronchitis include a cough producing yellow-green mucus, difficulty breathing, tightness in the chest, wheezing, fatigue, headaches, and swollen ankles, feet, and legs.

Asthma

Asthma is a common chronic illness for children and adults. Signs are wheezing, coughing, loss of breath, and chest tightness. These problems happen when the breathing passages in the lungs close down and the lungs fill with mucus. Industrial pollution and toxics are common causes of asthma, but asthma attacks are caused by many things.



During an asthma attack, sit forward, hands on knees, hunch your back, expand your chest, and try to relax.

Treatment

To relieve an asthma attack, inhale medicines that open the breathing passages. If quick-relief medicine is not available, try strong coffee or black tea, **ephedra (ma huang)**, or **pseudoephedrine**. Quick-relief medicines control the effects of an asthma attack — they do not prevent attacks. For treatment, see a health worker.

Prevention

Long-term treatment can help prevent asthma attacks, make them milder, or less frequent. If no long-term medicine is available, use of **Nigella sativa** (black seed, kalonji, habba sawda) can prevent asthma attacks. 2 teaspoons of black seed 1 time a day with honey or yogurt will strengthen the lungs and immune system.

To prevent asthma attacks, avoid or reduce contact with what triggers the attacks, including:

- **smoke** from cooking, heating, and tobacco.
- **outdoor air pollution** from factories and automobiles. When pollution is bad, people with asthma should stay indoors and not do hard physical work.
- **chemicals** in paints, solvents, pesticides, perfumes, and cleaning products.
- **dust mites**. Remove stuffed toys and rugs from sleeping areas (see page 357).
- **animal hair and feathers**, including from pets.
- **cockroaches** and other insect pests (see pages 366 to 367).
- **mold** (see page 358).
- **emotional and physical stress** that often comes with major life changes, overwork, and hard physical exercise.

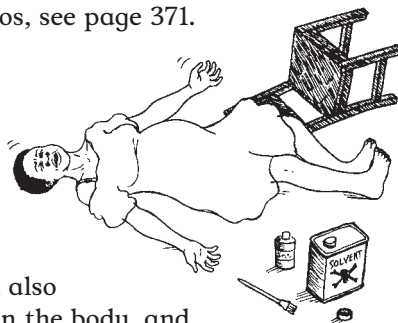
Asbestosis

Asbestos is a mineral that was once used for fire protection in buildings and some appliances. Asbestos is made of tiny fibers that get into the air and are breathed into the lungs where they cause permanent damage. Asbestos is so dangerous it has been banned by many governments.

Exposure to asbestos leads to **asbestosis** and lung cancer. Early signs of these illnesses are coughing, shortness of breath, chest pain, weight loss, and weakness. For more information about asbestos, see page 371.

Nerve Problems

Many toxic chemicals harm our nervous systems. Harm to the nerves can cause confusion, memory loss, seizures (fits), and other problems with the brain. Nerve damage can also lead to damage to taste and smell, loss of feeling in the body, and difficulty balancing and walking. Some chemicals can cause paralysis or even death. Solvents commonly used for cleaning grease, such as acetone, benzene, turpentine, and gasoline, are toxic to the nervous system.



Prevention

The best way to prevent harm to the nervous system from toxics is to reduce their use at work and in the home. If you must use them, make sure there is good **ventilation** and use gloves and masks (see Appendix A).

Skin Problems

The most common cause of skin problems and skin disease is from chemicals in the workplace. People also get rashes, blisters, and serious chemical burns from exposure to toxics in polluted air or water from industrial or agricultural chemicals and wastes.

Prevention and treatment

Protect yourself from chemicals by reducing exposure and wearing protective equipment (see Appendix A). When exposed to chemicals, wash the skin right away with cool water and soap. Avoid warm water because it opens the pores. If your skin has been damaged or made very sensitive from chemical exposures, avoid sunlight. If you must be in the sun, keep your head and body covered as much as possible.

Some skin creams can reduce pain and soreness, but reducing contact with the poison is the only way to stop the problem.



Multiple Chemical Sensitivity (MCS)

For some people, the combined effects of many chemicals or a large exposure to even 1 chemical may cause an illness called **multiple chemical sensitivity (MCS)** or environmental illness. People with MCS have strong reactions to common toxins in paint, perfume, cars, and building materials.

Signs of MCS may include runny nose, itchy eyes, headache, scratchy throat, ear ache, scalp pain, mental confusion or sleepiness, fast heartbeat, upset stomach, nausea, abdominal cramping, diarrhea, and aching joints.

Because people show different signs of MCS, many health workers do not believe it is a real illness caused by chemicals. Instead, they think it is caused by emotional distress. MCS is also often mistaken for common allergies (see page 357), but it is different from allergies for these reasons:

- Signs appear each time the person is exposed to chemicals.
- The effects are long lasting (**chronic**) and not seasonal.
- Signs appear with less and less exposure.
- The signs go away when the triggering chemicals are removed.
- Signs appear in the presence of different and unrelated substances (such as paint and perfume, or plastics and cigarette smoke).

Prevention and treatment

The best way to prevent MCS is to stay away from chemicals that may cause it. Because each person reacts differently, treating MCS depends on the person who has it, although all improve when the toxins are removed from their environment.

Our Chemical Body Burden

Some chemicals leave the body quickly after a person is exposed. Others may remain in fat, blood, or bones for a long time. For example, **arsenic** usually stays in the body for only 3 days after a person is exposed 1 time. Other chemicals, such as the pesticide DDT (see page 150), can stay in the body for 50 years or more. The **chemical body burden** is the amount of toxic chemicals that are present in the human body at any time.

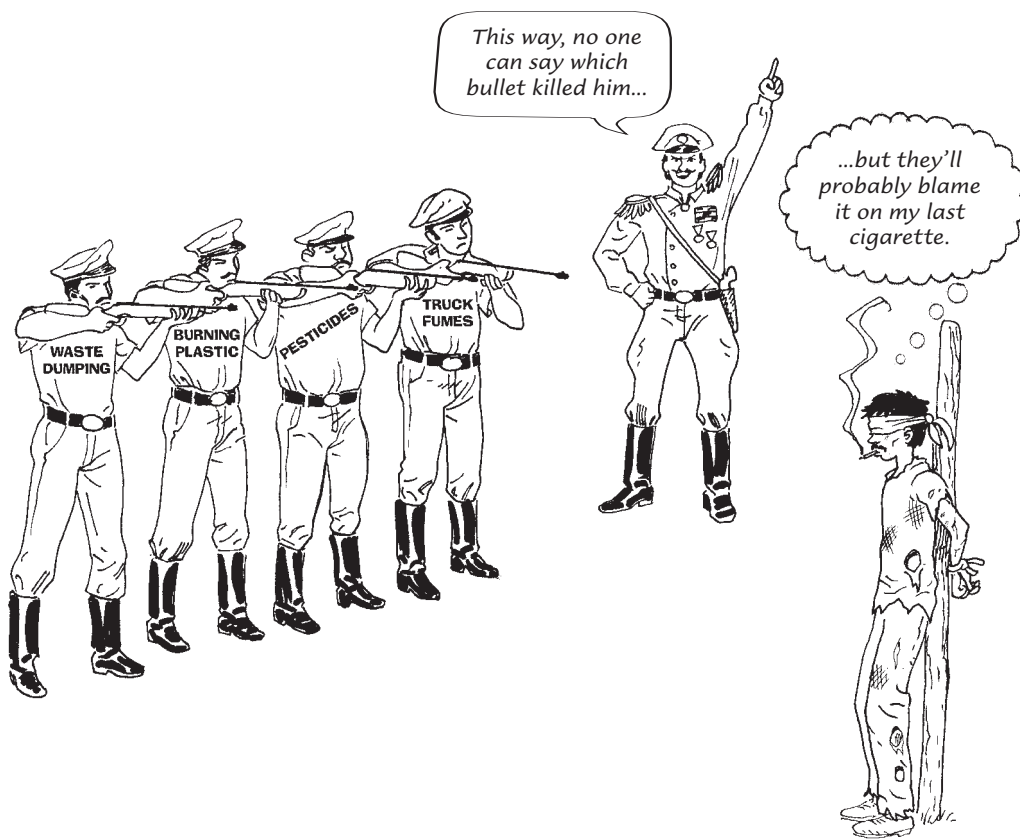
Just because we have these chemicals in our bodies does not mean that every one of us will get sick. Some people may get sick even though they have few toxic chemicals in their bodies. Others who have more chemicals may not get sick (see page 321).

Children often have a greater body burden than adults. Although they may have a shorter period of exposure because of their age, their bodies have not yet developed ways to protect themselves from toxics or to remove toxics from their bodies.

Toxic mixtures

There are so many chemicals in our environment that often we cannot know which ones we are exposed to or how the combination may affect us. This chemical mixture makes it especially difficult to trace a person's health problems to chemical exposure. In most cases though, chemical mixtures are more harmful than each chemical by itself.

Scientists study each chemical alone to see how it can harm a person's health. But many chemical products, such as cleaners, dyes, plastics, paints, and glues, are a mixture of several chemicals. For example, paint contains solvents, pigments, and other materials. Solvents cause 1 set of health problems, and pigments cause another. Mixed together, they can cause a third set of health problems, including ones that each chemical alone might not cause. Most waste from industry, such as smoke from a smokestack or chemical waste dumped into waterways, is also a mixture of many chemicals.

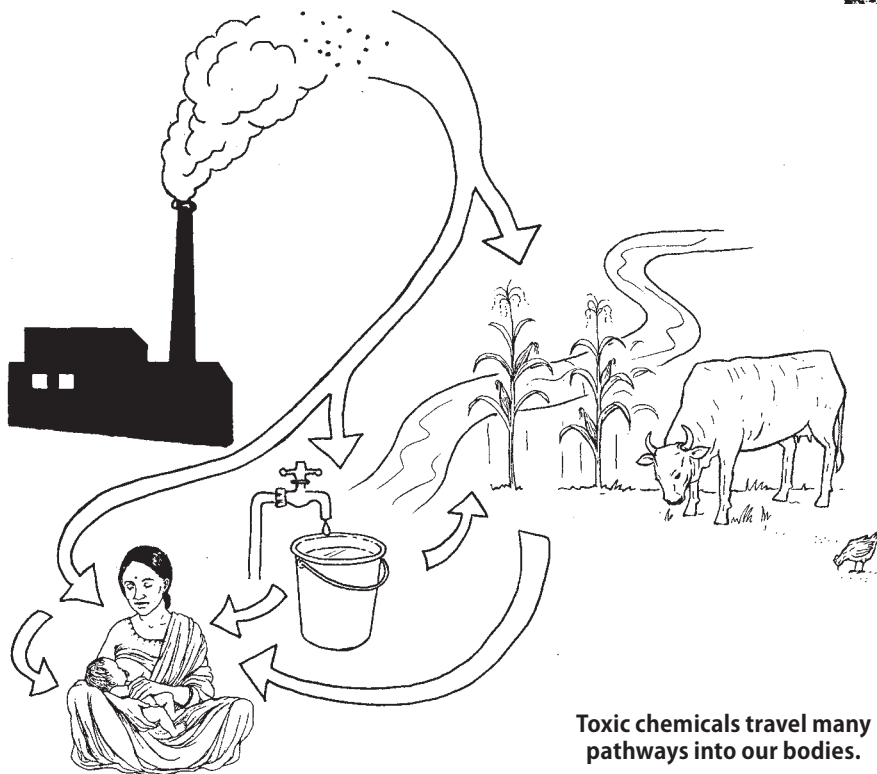


How toxics move through the environment

Many toxic chemicals travel far from their sources through air, water, and food, and in products we use every day, such as plastics, cleaners, and pesticides. Some of these chemicals remain in the environment for a long time. Every person on earth carries toxic chemicals in their bodies.

Toxic chemicals collect in the fat of people and animals, and in some plants. When people or large animals (such as bears, owls, hawks, or large fish) eat smaller animals, fish, or plants, toxic chemicals in them are passed along through the **food chain** or **food web** and accumulate in the bodies of those eating them.

Toxic chemicals turn the web of life into a web of death.



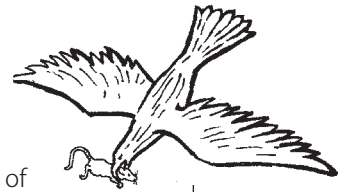
Toxic chemicals travel many pathways into our bodies.

Deadly links: Toxic chemicals pass from animals to people

In this activity, people play the parts of different kinds of animals to show how some toxics are passed from one to another. At least 7 people are needed for this game, the more people the better!

Time: ½ hour to 1 hour

Materials: 20 or 30 necklaces made of colored beads. About half are of one color, such as yellow, and the other half have beads of two colors, such as yellow and red.



- 1 Each person takes the role of an animal. We use hawks, mice, and grasshoppers, but you can use any familiar animals. Choose a small number of hawks (1 or 2), more mice (4 to 10), and lots of grasshoppers. Use armbands, signs, or other markers to identify the different kinds of animals. The facilitator places the colored necklaces in sight around the area where the game will be played.
- 2 The facilitator announces that the colored necklaces are food for grasshoppers. What she doesn't say is that the red beads are toxic chemicals that have collected in the food. The grasshoppers collect their food by putting necklaces around their necks. Each grasshopper collects as much food as possible, remembering how many necklaces she collected in total.
- 3 Next, release the mice into the play area to hunt the grasshoppers. Whenever a mouse catches a grasshopper, he or she puts on all the necklaces the grasshopper was wearing and the grasshopper leaves the game. Each mouse should have time to catch one or more grasshoppers and put on the necklaces he collects.
- 4 Release the hawks into the game to hunt the mice, while the mice are hunting grasshoppers. Any mouse caught by a hawk turns over all of its necklaces and then sits out.
- 5 Once the hawks have collected all the necklaces, all the players gather in a circle. Ask each grasshopper and mouse how many necklaces they collected before they were eaten and if any of these necklaces had red beads on them. Then ask the hawks to show the necklaces they collected.
- 6 Begin a discussion, telling the group that the red beads are toxic chemicals in the food. Explain that the hawk with the most red beads dies because the most toxics have accumulated in her body. Other hawks may survive, but will lay eggs with thin shells or hatch sickly chicks. Ask the group to discuss how toxic chemicals get into their water or food. What foods do people eat that may have toxic chemicals in them? How can we keep toxic chemicals from accumulating in our bodies? How can we keep them out of the environment?

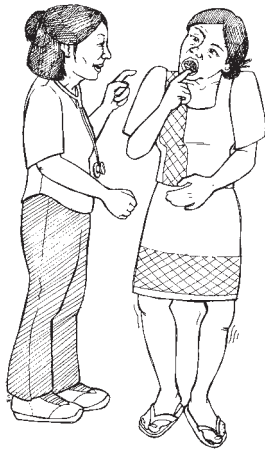
Heavy Metals

Heavy metals such as **lead**, **mercury**, **cadmium**, and **chromium**, are harmful to people, animals and plants, even in very small amounts. Heavy metals are released into the environment by many industries, such as oil drilling and refining, mining, metal **smelting**, tanneries, and **incineration**.

Heavy metals are harmful when people breathe in or swallow dust or fumes, or get them on the skin or in their eyes and absorb them into the blood. Heavy metals may also collect in plants and animals and cause harm when people eat them.

Signs of heavy metal poisoning

Heavy metal poisoning usually does not happen from one large exposure, but from exposure to small amounts over time. Early signs include shaking, irritability, difficulty concentrating, tiredness, and weakness in the hands and feet. Other signs include:



Headaches, dizziness, sleeping problems, memory loss (especially in mercury poisoning), difficulty thinking

Skin rash, irritations of eyes and nose

Bleeding gums, blisters in the mouth, toothaches, jaw pain, metal taste in the mouth

Rapid heartbeat, anxiety, and a very weak or very strong pulse

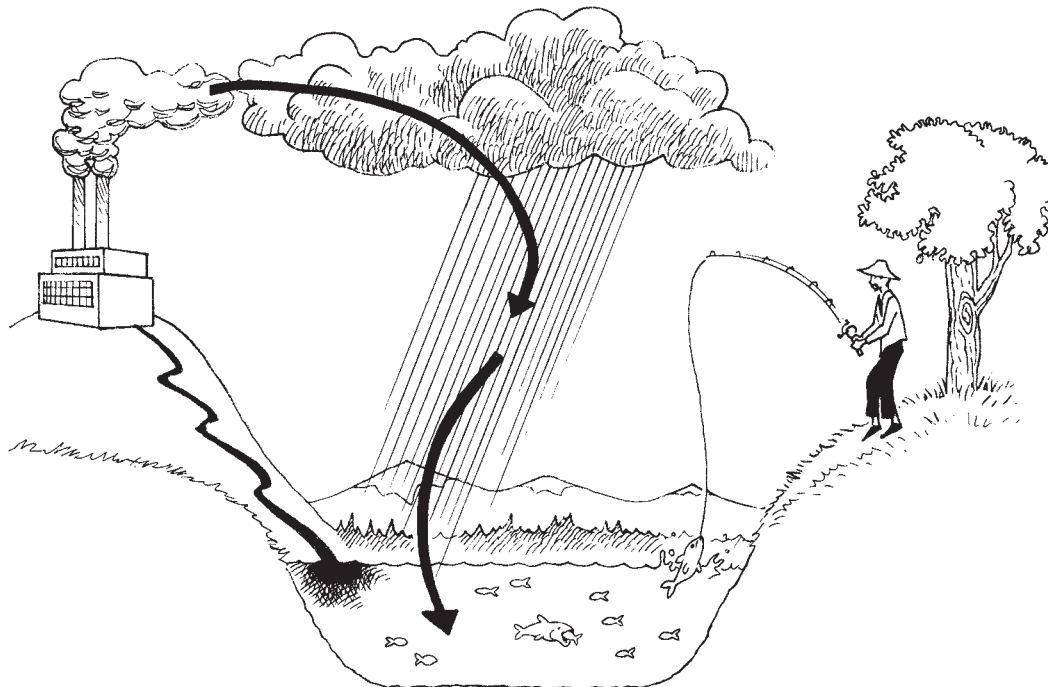
Stomach pain, bloating, diarrhea or constipation, a need to urinate often

Muscle spasms, pain and stiffness in joints and muscles, cold hands and feet

Heavy metal poisoning can also cause damage to the kidneys and the reproductive system, and other serious long term health problems.

IMPORTANT: If you suspect heavy metal poisoning, see a health worker for testing right away. If you are exposed to heavy metals day after day, medicine will not stop the poisoning. The only way to stop the poisoning is to stop being exposed. If you do have heavy metal poisoning, it is likely that others in your community will also.

The next few pages discuss problems of mercury. Other heavy metals have similar problems. See problems from lead on pages 368 to 370.



Heavy metals travel through the air, into water, fish, soil, and plants, and into our bodies.

Mercury poisoning

Mercury is a heavy metal that can cause serious health problems when it is released into the environment by mining, especially gold mining, burning coal, building dams, or when products that contain mercury become waste. Mercury is highly toxic.

When mercury collects in rivers, lakes, and streams and combines with rotting plants, it can turn into a more toxic form called methyl mercury. Even a very small amount of mercury can poison all the fish in a pond or river. Methyl mercury in the environment is toxic for centuries.

Health problems from mercury

Breathing in or absorbing through the skin even a very small amount of mercury can cause damage to the nerves, kidneys, lungs, and brain, and birth defects. The health problems can take many years to show up.

Mild mercury poisoning causes tingling in the lips, tongue, fingers, and toes, and trembling in the hands and feet. In some cases, these signs do not appear until long after exposure.

Severe mercury poisoning causes headaches, memory loss, difficulty coordinating movement and vision, dizziness, metal taste in the mouth, muscle spasms, pain and stiffness in joints and muscles, rapid heartbeat, and a very weak or very strong pulse.

Exposure to mercury in men can lead to loss of ability to have sex, and sterility.

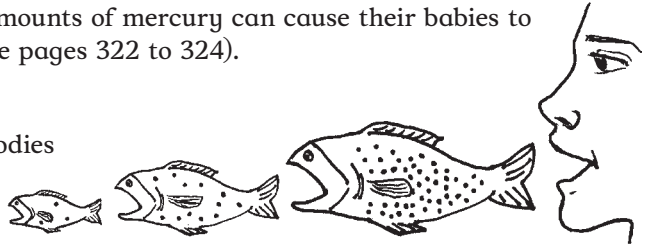
Exposure to mercury in women can lead to failure to have monthly bleeding and other problems in having babies.

In pregnant women, even small amounts of mercury can cause their babies to have developmental problems (see pages 322 to 324).

Mercury in fish

Methyl mercury collects in the bodies of fish, animals, and people.

Fish that live in polluted water can be dangerous to eat, even though the water itself may not be harmful to bathe or swim in.



Because larger fish and animals usually eat many smaller ones, the mercury builds up in their bodies.

Small amounts of mercury can pass through the body without causing harm. If we stop eating food that contains mercury, our bodies begin to get rid of the mercury that has collected. But when we take in more mercury than our bodies can get rid of, mercury causes serious health problems.

Fish are good food, full of protein. Fish are sometimes called “brain food” because they have fats that are good for the brain. They are part of traditional diets for many people. But if they are caught in waters where mines drain or where mercury has been dumped, they may have unsafe amounts of mercury.

Fish and food safety

You cannot tell if a fish contains mercury by looking at it. Because mercury is stored in the flesh of the fish, there is no special way to clean or cook fish that will prevent mercury exposure. Some types of fish are likely to have less mercury in them, due to their feeding habits or life histories, and are safer for people to eat. If you live in a mine-drainage area,

it is more dangerous to eat:

- larger, older fish.
- bottom-feeding fish, such as catfish and carp.
- only fish as your main food.
- fish organs, especially the liver.

it is safer to eat:

- smaller, younger fish and fish that feed on insects.
- less fish. Meat, chicken, rice with lentils or beans, eggs, milk, and cheese are other good sources of protein.
- fish mixed with foods like rice or potatoes. This will not reduce the amount of mercury in the fish, but it will reduce the amount of fish you eat at your meal.

Treatment for heavy metal poisoning

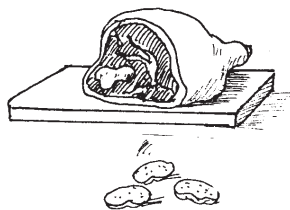
Heavy metal poisoning is very difficult to treat. The main treatment is called chelation (pronounced kee-lay-shun). Chelation uses herbs and medicines to carry toxic metal out of the body. It is most effective for poisoning caused by sudden exposure to a large dose of metals (**acute** poisoning). Most exposure to heavy metals is from daily contact over a long period, so this treatment may not be useful.

Good nutrition can protect the body

When people do not have enough vitamins, calcium, iron, or protein in their diet they may suffer more severely from heavy metal poisoning. The body will use toxic heavy metals to fill in for the missing nutrients — leading to serious illness.



Foods that help the body resist heavy metal poisoning include: Beans, whole grains, meat, nuts, eggs, milk, red, yellow and green vegetables, dark leafy greens, coriander, cabbage, and fruits.



IMPORTANT: People who have goiter or may have chronic cyanide poisoning should avoid foods that make goiter worse, such as cabbage and cassava.

No foods will treat severe poisoning from heavy metals or other toxic chemicals. However, improving the diet helps in treating most illnesses, including illnesses caused by heavy metals. In areas where people are very poor and are exposed to heavy metals and other toxics, such as mining communities, the best approach may be a community nutrition program to ensure that everyone is well-fed, strong, and resistant to illness. (For a story about a nutrition program in a mining community, see page 475.)

POPs (Persistent Organic Pollutants)

One group of chemicals called **POPs (Persistent Organic Pollutants)** becomes more dangerous as each chemical passes from air or water to accumulate in animals, fish, and people. **Persistent** means they stay in the environment and in our bodies for a long time. **Organic** means they can enter and affect all living things. **Pollutants** means they are dangerous for the environment.

The most common POPs are **dioxins** (a chemical waste from manufacturing and incineration), **PCBs** (a chemical fluid used in electronics and many household products), and many kinds of pesticides (including DDT).

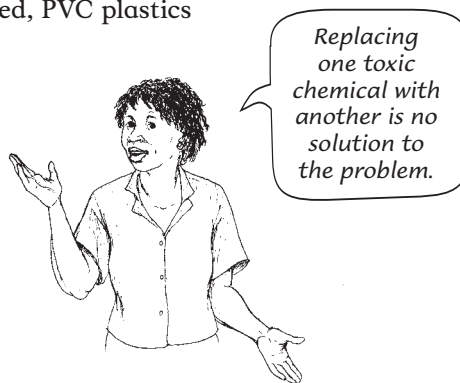


POPs travel through air, water, and soil. They collect in the bodies of living things and accumulate as they pass along the food web (see page 335). Because of this, POPs are found everywhere in our environment, even in places far from where they were produced.

Dioxins are some of the most toxic POPs. Most dioxin is released when PVC plastic, bleached paper, coal, diesel fuel, and other things that contain the chemical **chlorine** are burned. Dioxin is also released from metal smelting, cement making, papermaking, and some pesticides. Dioxin released into air and water sooner or later gets into our food and drinking water. Dioxin causes cancer.

PVC plastic is commonly used to make pipes for water systems. PVC is also used in baby bottles, toys, food containers, and other everyday products. As PVC plastic gets old and worn down, it can release toxic chemicals, causing serious illness. When burned, PVC plastics release the harmful POPs dioxins and furans.

PCBs (Poly chlorinated biphenyls) are one kind of POP formerly used in electrical equipment, such as transformers and switches, and in products such as carbonless copy paper and dyes. Because they are known to be very toxic, PCBs are now banned internationally and replaced in some cases by other chemicals called PBDEs. But PBDEs also stay in our bodies for a long time, and also cause serious health problems such as damage to the brain and nerves.



We can begin by stopping things we know are bad, like dioxins and PCBs.



Health problems from POPs

Even small exposures to POPs cause problems such as sterility and birth defects. Some POPs cause the body to become more sensitive to other chemicals as well (see page 333).

Protecting your community from POPs

POPs are a part of many products used every day. The only way to prevent harm from POPs is to stop buying them, stop using them, and stop making them.

- Avoid buying products made from PVC. PVC products often smell strongly when first used or exposed to hot sun, and are often marked with the “3” or “V” symbol on the bottom of the product. If you have to buy plastic, those with numbers 2, 4, 5, and 1 are the safest.
- Do not use plastic bags and disposable (often bleached) paper products. Instead, use cloth bags and reusable plates and cups.
- Avoid burning trash, especially plastic trash (see pages 409 and 423).
- Grow and buy foods without chemical pesticides. Support farmers who use sustainable farming methods (see Chapters 14 and 15).
- Ask your health workers if they can get and use medical products that are not made of PVC plastic.
- Support laws that ban incineration of waste.
- Join the campaign calling for the total elimination of POPs (see Resources).



Radiation

Radiation is an invisible form of energy. Some radiation, such as sunlight, is good for us. But some radiation, from heavy metals such as uranium (see page 491), causes **radiation poisoning**, cancers, skin diseases, and birth defects. Radioactive materials poison the land and water for many generations.

Most radioactive materials are produced by the military and used for making war. Radiation exposure is most common where weapons are made, tested, and used, such as military bases and war zones. Radioactive materials used by the military are sometimes recycled and show up in other metal products, causing harm to people who have no way to know they are exposed.

Radioactive metals are also used in some products such as electronics, causing harm to workers exposed to them. People who work at nuclear power plants, uranium mines, or nuclear dumping sites are also at serious risk for radiation exposure.

Radiation sickness

Radiation can cause cancer of the lungs, thyroid, and blood, as well as diseases that affect the bones, muscles, nervous system, stomach, and digestive system.

Most exposure to harmful radiation occurs in small amounts over a long time, causing health problems to develop slowly. Uranium miners, for example, may work for many years with no signs of illness. Years later, they can develop lung cancer and other illnesses related to their work with radioactive materials (see page 473).

Soldiers who handle radioactive missile shells (depleted uranium shells) and people in war zones where the shells are left among the rubble of destruction are also developing radiation sickness.

Nuclear accidents or explosions can cause death right away or within several weeks. People who survive 6 weeks after an explosion may recover for a while, but serious illness can return years later.

Radiation can pass to nursing infants through breast milk. Radiation sickness cannot be passed from person to person, but the damage it causes can pass down from parents to children and grandchildren, as birth defects, cancers, and other health problems.

Signs

Early signs of radiation sickness include nausea, vomiting, diarrhea, and fatigue. These signs may be followed by:

- hair loss
- burning feeling in the body
- shortness of breath
- swelling of the mouth and throat
- worsening of tooth or gum disease
- dry cough
- pain in the heart
- rapid heartbeat
- permanent skin darkening
- bleeding spots under the skin
- pale or transparent skin, gums, and fingernails (**anemia**)
- death

Grandmother did not know what radiation was until it killed Grandfather.



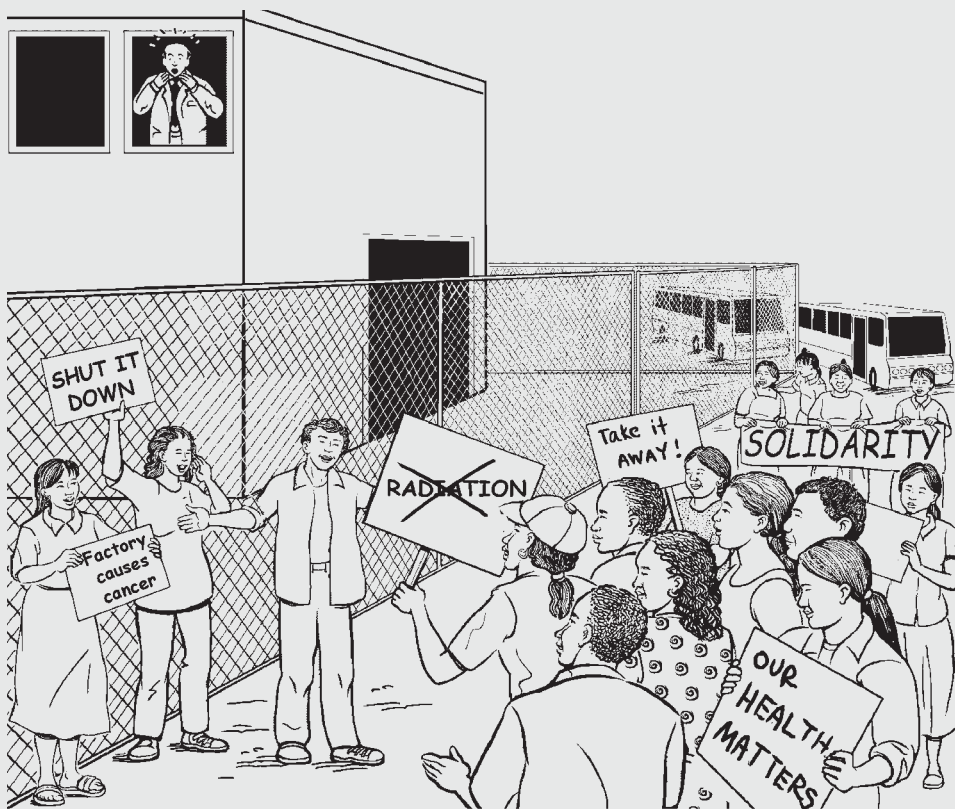
Organizing against radiation poisoning

Asian Rare Earth Company, owned partly by Mitsubishi Corporation of Japan, ran a factory for 10 years in the village of Bukit Merah, Malaysia, to produce a rare metal that was used to make the red colors in television screens.

The factory dumped radioactive waste in the village and many villagers suffered cancers and birth defects caused by the radiation. The factory had not fenced off the waste site, posted any warning signs, or taken any other measures to reduce harm to the villagers.

Community residents brought a lawsuit against the company to shut down the factory. Along with the lawsuit, they held many public protests that were widely reported on local radio and television. After 7 years, a Malaysian court ordered Asian Rare Earth to close its plant in Bukit Merah and remove all its radioactive waste and toxic chemicals.

By using public protest, media, and lawsuits, the villagers prevented further health problems by forcing the factory to shut down.



Healing Toxic Injuries

Toxic chemicals are so widespread that it may seem impossible to be free of them, and to prevent and heal the illnesses they cause. However, people all over the world are developing new treatments for toxic injuries that combine modern medicine with traditional ways of healing.

Sambhavna Clinic

Since the 1984 chemical disaster in Bhopal, India, thousands of people there live with chronic health problems. These include breathing problems and fevers, and also reproductive problems, loss of vision, cancers, and birth defects in the next generation of children. (To read more about the disaster, see Chapter 4.)

Perhaps the greatest lessons from the Bhopal disaster come from the people's campaigns for health and justice. Sambhavna Clinic was built by survivors of the disaster and other volunteers to provide health care to the whole community. In seeking ways to relieve the severe health problems following the poison gas leak, the health workers discovered new medical treatments, proving that good care and creativity are the keys to healing toxic injuries.

How the clinic runs

The Sambhavna Clinic has treated more than 12,000 people for no charge. Half of the clinic staff are survivors of the Bhopal disaster. The clinic also carries out studies that are helping the world understand the long-term effects of chemicals.

In their own words, these are the guiding principles of Sambhavna clinic:



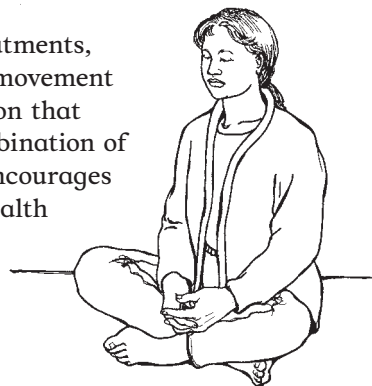
Clinic treatments

Health workers at Sambhavna use many kinds of treatments, including herbal medicines and yoga, breathing and movement exercises that treat body, mind and spirit. Every person that comes to the clinic has a choice of which kind or combination of treatments they want to use. In this way, the clinic encourages people to participate in their own healing, and the health workers learn that different treatments work for different people.

A mental health worker treats problems such as panic attacks, disturbed sleep, depression, irritability, and impaired memory. Drugs may be given, though drugs with harmful effects are avoided. Herbal medicines, massage, and baths in hot water and medicinal oils are used to **detoxify** the body (cleanse by removing poisons).

Yoga helps heal the internal organs, manage pain, and control each person's disease process. Though many survivors, especially Muslims who do not traditionally practice yoga, were skeptical at first, yoga has been found to be one of the most helpful treatments, particularly for people suffering from chronic diseases.

Finally, the clinic prepares and provides medicines using local herbs. All medicines are free of cost, and clinic workers provide information to make sure that people are well informed about what they are taking. The clinic is also built and maintained in a way that reduces toxic exposures (see page 40).



Many people practice yoga to improve the health of both mind and body.



A candle against the darkness

The word *Sambhavna* means “possibility” in the Sanskrit and Hindi languages. Often, the people most affected by environmental disasters, such as in Bhopal, have little hope for recovery, justice, or for health. By using creativity, caring, and faith in the ability to heal, the health workers at Sambhavna have turned despair into hope.