In 1987, about 45% of Americans were living with one or more chronic conditions (a term that includes chronic diseases and impairments). In 1935, the proportion was 22%, so chronic conditions have approximately doubled during the last 60 years. The majority of people with chronic conditions are not disabled, nor are they elderly. In fact, one out of every four children in the U.S. (25%) now lives with a chronic condition.[1]

Chronic conditions can often be "managed" (helping people to live with the condition), but they usually cannot be cured. The cost of chronic care in 1990 was estimated to be $659 billion --nearly three quarters of all U.S. health care costs. (To get this huge number into perspective, it may help to know that the entire U.S. military budget is $250 billion per year.)

Perhaps it is time we looked seriously at prevention as an approach to chronic conditions.

Humans and other vertebrates (animals with a backbone) come equipped with a complicated "immune system" which PREVENTS diseases that might be caused by pathogens (bacteria, viruses, fungi, and parasites) or cancerous cells. We are constantly exposed to hundreds of pathogens in daily life, but our immune system recognizes them as dangerous and swiftly isolates them and removes them from our bodies. The immune system is a built-in disease-prevention mechanism that works hard to keep us healthy so long as we keep our immune system healthy.

If the immune system is damaged in certain ways, it can allow pathogens to overwhelm our defenses and make us sick. Under other circumstances (which are poorly understood), the immune system goes haywire and attacks its host, causing major damage of a different kind, known as "autoimmune" diseases. These "autoimmune" diseases include insulin-dependent diabetes, multiple sclerosis, lupus erythematosus, scleroderma, rheumatoid arthritis, and about a dozen others.[2] In these diseases, the immune system attacks and breaks down the host organism, causing prolonged misery and death.

A third class of immune disorders is "hypersensitivity reactions," or allergic reactions, such as asthma, hay fever (allergic rhinitis), and food allergies (to milk, egg whites, peanuts, fish, soy and other foods), some of which may be minor, others of which may be fatal.

As early as 1984, the U.S. National Toxicology Program [NTP] (within the U.S. Department of Health and Human Services) observed that chemical damage to the immune system could result in "hypersensitivity or allergy" to specific chemicals or to chemicals in general. NTP said damage to the immune system can have far-reaching consequences for an individual, leaving him or her vulnerable to attack by bacteria and viruses, at heightened risk of cancer, and even predisposed to develop AIDS.[3]

Unfortunately, during the past 50 years, corporations have been permitted to release more and more industrial chemicals and consumer products that damage the immune systems of birds, amphibians, reptiles, fish, and mammals, including humans. The immune system itself has only been fully recognized since the 1950s, and it wasn't until the 1970s that all the major components and activities of the immune system were identified. Many of these are not well understood even today.[2]

Partly as a result of this ignorance, public health authorities have still not established consistent criteria for measuring damage to the immune system,[4] which of course allows corporate polluters a lot of "wiggle room" when they are asked to stop releasing --or to clean up past releases of --immunotoxic chemicals such as PCBs, cadmium (see REHW #179), and mercury (REHW #462). PCBs are a class of industrial chemicals outlawed in the U.S. in 1976 because of their dangerous properties. Unfortunately, large quantities of them persist in the environment to this day, affecting wildlife and humans.[5]

A new study of immunotoxic chemicals affecting mammals appeared earlier this year in ENVIRONMENTAL SCIENCE AND TECHNOLOGY, a publication of the American Chemical Society.[6] Since 1987, large numbers of dolphins, seals, and sea turtles have been killed by disease in the Atlantic Ocean, the Gulf of Mexico, the North Sea, and the Mediterranean. (See REHW #399.)

In this new study, researchers examined carcasses of bottlenose dolphins found dead on Atlantic and Gulf coast beaches in Florida, 1989-1994. They found elevated levels of tin, a toxic metal that has been used for the past 40 years to paint the bottoms of boats and ships to prevent the growth of barnacles and slime. (The specific tin compounds are tributyl tin, dibutyl tin, and monobutyl tin, together called organotin compounds. Tributyl tin is added to paint to prevent growth of organisms on ships' bottoms; it slowly degrades into the other two compounds.) The tin found in bottlenose dolphins was compared to the tin found in spotted dolphins, and pygmy sperm whales, which spend their lives far offshore. The bottlenose dolphins had higher levels of tin, presumably because they spend their lives close to shore, where anti-fouling paint from boats and ships has contaminated bottom sediments and local food chains.

The researchers conclude that the tin compounds --which are well established immunotoxins --combined with PCBs and the pesticide DDT, which are also found at high levels in dolphins and which are also well-established immunotoxins --together may have deprived the dolphins of their main defense against disease, their immune systems. They then succumbed to bacteria and viruses that they had previously been able to live with.

Other common agents and environmental contaminants known to harm the immune system include:

** Ultraviolet light from the sun --the kind of light that is increasing in the northern latitudes of the Earth because chlorofluorocarbons (CFCs) have damaged the planet's protective ozone shield 10 to 30 miles in the sky. (See REHW #246, #441.) Ultraviolet sunlight striking the inhabited portions of the planet has increased 5% to 10% in recent years. In sum, we are now all taking a bath in a moderately immunotoxic agent.[7]

** Dioxin and PCBs. As mentioned above, PCBs are a class of industrial chemicals now outlawed in the U.S., but still present in many parts of the environment at toxic levels. Dioxins are a class of chemicals created as unwanted byproducts of incineration, metal smelting, and the manufacture of many pesticides. Dioxins and PCBs are carcinogenic and powerfully immunotoxic in many animals, including humans. (The International Agency for Research on Cancer [IARC] --part of the World Health Organization --announced February 14, 1997, that the most potent dioxin, 2,3,7,8-TCDD, is now considered a Class 1 carcinogen, meaning a "known human carcinogen".)[8]

In monkeys (marmosets), changes in white blood cells associated with the immune system can be measured at dioxin levels of 10 ng/kg (nanograms of dioxin per kilogram of body weight) --25% below the dioxin level already found in average Americans. Mice with body burdens of 10 ng/kg --25% below the amount already found in you and me --display an increased susceptibility to infections by viruses, presumably because their immune system has been damaged. (See REHW #463 and #414.)

** Agent orange --the chemical used by the U.S. in Vietnam to defoliate the jungle, damages the immune system. Furthermore, Vietnam veterans have an above-average likelihood of being struck by diabetes --a serious immune system disease. (REHW #463.) In the general population in the U.S., the incidence (occurrence) of diabetes has tripled between 1964 and 1981.[9] It is worth noting that Agent orange is composed of two pesticides, 2,4,5-T and 2,4-D. Though 2,4,5-T was banned in the U.S. in the early 1980s for fear of birth defects, 2,4-D is still most the popular herbicide used to kill
broad-leaf weeds, such as dandelions, in lawns today. After people spray 2,4-D on their lawn, it is carried indoors on the family dog and on children's feet. Once indoors, it contaminates rugs and carpets and persists for a very long time. (REHW #436)

** Many pesticides damage the immune system. In 1996, a study of pesticides and the immune system, published by the World Resources Institute (WRI), examined a growing body of literature from around the world, showing that many common pesticides degrade the immune systems of laboratory animals, wildlife, and humans.[10]

WRI examined studies of all major classes of pesticides -- organochlorines such as DDT, organophosphates such as malathion, and carbamates such as aldicarb. All three classes were immunotoxic.

** Living near a toxic dump damages the immune system in some people, though these effects have been rarely studied. (REHW #272)

** Exposure to fibers of asbestos and fiber glass damages the immune system. (REHW #444.) These effects may be more common than, and perhaps more important than, cancer caused by exposure to such fibers, but have been largely ignored in favor of cancer studies.

** Organochlorine chemicals, including those known as "endocrine disrupters," damage the immune system. The endocrine (hormone) system strongly influences the immune system, so chemicals that mimic hormones may disrupt immune functions.[11] In addition, common chlorine-containing chemicals such as perchloroethylene (dry cleaning fluid), trichlorethylene (a common industrial solvent), and chloroform (created in drinking water when it is chlorinated to kill germs) can damage the immune system. (REHW #279, #365, #399)

Since 1970, the U.S. has spent 98% of its health dollars trying to cure diseases, and only 2% trying to prevent them.[12] During this same period, many diseases connected to the immune system such as asthma (REHW #218, #374) and diabetes have increased dramatically, and deaths from infectious diseases (not including AIDS) have increased 22%. (REHW #528) These seem to be strong indications that immune disorders are increasing. Perhaps all these immunotoxins are having a cumulative effect.

The U.S. government does not seem prepared to cope with these problems. To prevent damage to the immune system would require strong action to curb the release of immunotoxic chemicals into the environment. This would require a government that is independent of, and stronger than, the corporations releasing the chemicals. At present we do not have anything close to that kind of government.

--Peter Montague (National Writers Union, UAW Local 1981/AFL-CIO)


[8] According to the press statement, the new IARC finding on dioxin will be published in Volume 69 of IARC MONOGRAPHS ON THE EVALUATION OF CARCINOGENIC RISKS TO HUMANS. The IARC can be contacted at: IARC, 150 Cours Albert Thomas, 69372 Lyon, France.


[12] Speech by Gilbert Omenn, Dean, School of Public Health and Community Medicine, University of Washington, given at the meeting of Grantmakers in Health, Fort Lauderdale, Florida, February 27, 1997.

Descriptor terms: chronic diseases; immune system; children; health care costs; prevention; diabetes; multiple sclerosis; lupus erythematosus; scleroderma; rheumatoid arthritis; arthritis; hypersensitivity reactions; allergies; national toxicology program; cancer; bacteria; viruses; fungi; parasites; corporations; dolphins; marine mammals; gulf of mexico; atlantic ocean; tributyltin; tin; pbcs; ddt; uvb; ultraviolet radiation; cfes; chlorofluorocarbons; dioxin; carcinogens; iare; international agency for research on