

HOW HAZARDOUS WASTES AFFECT HUMAN HEALTH

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When historians look back to the twentieth century a hundred years from now, it is very likely that one of the characteristics that will be noteworthy, along with rapid industrialization, will be the failure of the nations of the world to have dealt with hazardous wastes, leaving a legacy of pollution for later generations. This problem is one of industrial countries, of developing countries and of countries of all political persuasions. The problem has been the result of economic development and political rivalries, but mostly one due to lack of knowledge and lack of concern of the long term consequences of careless disposal of hazardous materials.

Each hazardous waste site is different. There are different chemicals present, different geology leading to different problems with regard to transport of pollutants from the site, and different densities of human populations nearby. There are different mixtures of metals, solvents, organics, municipal wastes, inorganics, pesticides and herbicides, paints and oils and radioactive wastes. Pollutants may migrate off site via air, surface or ground water, or through soils and sediments. Humans are exposed to the hazardous materials by direct contact, breathing contaminated air, or they may ingest the pollutants via drinking water or contaminated food (Fig. 1). The purpose of this conference is to bring together those individuals with experience in the problems of hazardous wastes in their own countries with this complex problem from the points of view of preventing harm to human health, preserving and restoring the environment and doing so within the economic and practical restraints in which we all must operate.

While each site is different, let me describe one particular hazardous waste site with which I had some involvement and which opened our national consciousness to the issue in the US. This is Love Canal, located near Niagara Falls, NY. Love Canal was an unfinished manmade waterway owned and operated by the Hooker Chemical Company into which some 20,000 tons of hazardous materials, containing at least 248 different chemical compounds, were deposited between 1930 and 1952. These included solvents, chlorinated organics and metals. When the Canal was full and the chemicals were covered, the land was given to the city at a cost of one dollar and a school and many houses were built on the site. Fortunately none of the residents in the area derived their drinking water from wells, but the chemicals migrated through subsurface swales into yards and homes. In the mid 1970s residents began to complain about foul odors in their basements, and the appearance of oily chemicals in their yards, basements and in the school playground.

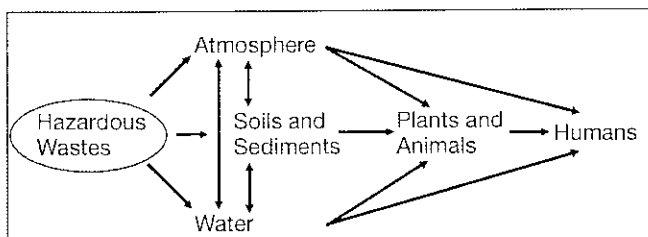


Fig.1. Mechanisms of human exposure to hazardous wastes.

When the inhabitants of Love Canal became concerned about potential health hazards from exposure to these chemicals, neither the state of New York nor the federal government were experienced or equipped to quickly evaluate how serious the health effects were. The response in the community can only be described as panic, with particular concern about cancer, birth defects and just about every other human health ailment imaginable. There was also enormous anger at and distrust of government, business and health "experts" who gave a variety of opinions. The state and federal government evacuated the area, bought most of the homes that were close to the site, and closed the school, and the area was declared a Federal Disaster Area. The people moved away. Some of the area remains uninhabited to this day.

The health studies that have been done found no increased incidence of cancer (1) or chromosomal abnormalities (2). The most serious health effect that was relatively well documented was an increase in low birth weight in the exposed population between 1940 and 1953 (3,4). Other less well documented reports include short stature, learning problems, hyperactivity, headaches, skin rashes, abdominal pain and incontinence in children (5,6). However the full nature of the actual harm to human health will never be known because the population scattered before health authorities could adequately address the problem.

There are a number of lessons that should be learned from the Love Canal experience. One is that people do not want to be exposed to health risks that come from hazardous wastes. Another lesson is that we who are responsible for the public health must be prepared with information on the degree of hazard from hazardous wastes, and have a plan for reducing this hazard if it exists.

Moreover, we must be prepared to effectively communicate this information to the public in ways that are accurate, yet not panic-provoking. And a final lesson is that children are a particularly sensitive population, often demonstrating harm from hazardous wastes long before disease becomes evident in the adult population.

While Love Canal is a striking example of the kinds of problems that can come from hazardous waste sites, it is by no means a unique site. It has been estimated that there are 439,000 hazardous waste sites in the US alone (7). Forty million people live within 4 miles (about 6.4 km) of these sites, and 4 million live within 1 mile (1.6 km) (8). These sites contain over 600 different chemicals that are known, plus many unknown substances. One study of leachate from a hazardous waste landfill found that only 4 % of total organic carbon could be characterized by GC/MS, and that this 4 % included 200 different chemicals (9). Many of those chemicals not identified may be mobile and hazardous to human health (10).

How does one even start to evaluate the health hazards of over 600 hundred different chemicals, each of which has its own toxicity, and many of which may act in synergy. With such a variety of chemicals, there is the possibility of every human