ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Health Study Findings

ATSDR's studies and research consistently have found an association between exposure to certain hazardous substances found at some Superfund sites and the occurrence of particular adverse health effects. Of the 30 hazardous substances most often found in completed exposure pathways at hazardous waste sites on the Environmental Protection Agency's National Priorities List (NPL), arsenic; benzene; cadmium; chromium; and vinyl chloride are known human carcinogens. In addition, many of these chemicals have adverse effects on the nervous, reproductive, and respiratory systems. Many of ATSDR's studies focus on adverse health effects related to these and other hazardous substances.

- Although epidemiologic findings are still unfolding, when health data from many Superfund sites are evaluated in aggregate, proximity to hazardous waste sites seems to be associated with a small-to-moderate increased risk of some types of birth defects, central nervous system defects, cleft lip and palate, heart defects, and limb reductions. Studies also have found an increased likelihood of low birth weight among infants born to mothers who live near toxic waste sites or who were exposed to contaminated drinking water.

- Although a number of studies have been conducted to determine the effects of hazardous substances on the development of cancer, it is difficult to determine whether a case of cancer is associated with exposure to chemicals at a hazardous waste site. Cancer often takes years to develop, making it more difficult to establish exposures to a carcinogen. ATSDR is developing new techniques to investigate the relationship between cancer and exposure to substances at waste sites. For example, the agency is using geographic information systems (GIS) technology to visually display the occurrence of particular health conditions in areas of greatest exposure to hazardous substances.

- ATSDR has conducted or funded several studies in the past few years that investigated the association between hazardous waste sites and respiratory illnesses among nearby residents. The types of sites investigated in these studies have included hazardous waste incinerators, lead smelters, and phosphate processing facilities. These studies demonstrate that symptoms of respiratory disease and reduced lung function are associated with exposure to hazardous substances.

- Neurotoxicity is the capacity of chemical, biological, or physical agents to cause adverse functional or structural changes in the nervous system. Even slight nervous system damage can cause memory loss, impaired ability to reason, motor dysfunction, and communication disturbances. Children and developing fetuses might be more susceptible to neurotoxic effects, and the effects of exposure before birth or early in life might not become apparent until much later. The progression and irreversibility of many neurotoxic effects are of great concern, for functional losses caused by toxicity can be debilitating. ATSDR's substance-specific research has provided greater insights to medical professionals on

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how toxic substances affect the nervous system. Several ATSDR health studies in communities near hazardous waste sites have found residents at increased risk for neurotoxic disorders.

- ATSDR has also conducted health studies to explore the relationship between immune function disorders and exposure to environmental toxicants found at hazardous waste sites. One of the agency's contributions to exploring this relationship is the development of a Basic Immune Test Battery to evaluate immune function in people living near hazardous waste sites. The test battery includes blood tests such as a complete blood count and a test for serum immunoglobulin levels.

The following are some examples of health studies performed by, or supported by, ATSDR that uncovered adverse health outcomes in people exposed to hazardous substances:

- A statewide case-control study of neural tube defects (NTDs) and specific drinking water contaminants that was done in New Jersey found elevated odds ratios (ORs) of 1.5 to 2.1 for the association of NTDs with total trihalomethanes in drinking water.

- An epidemiologic study of neurotoxicity in young adults 20 years after their childhood exposures to lead in Bunker Hill, Idaho, found significant adverse central and peripheral neurological effects in the study group exposed to lead compared to a comparison group 20 years following exposure.

- Using biomarkers as a tool to research the role of environmental exposure as risk factors for disorders of the immune system, the number of patients who had early stages of B-cell chronic lymphocytic leukemia was found to be almost twice as common among study subjects living near hazardous waste sites as those in comparison groups.

- A health study of former mine workers and residents of Libby, Montana, who were exposed via various occupational and environmental pathways to vermiculite ore contaminated with asbestos, found that 18 percent of those x-rayed had abnormalities of the lining of their lungs (pleural abnormalities). The risk of pleural abnormalities increased with increasing age and increased length of residence in the Libby area. Contaminated vermiculite ore has been shipped to several hundred sites all over the United States for processing and packaging, and millions of homes in the United States contain insulation using Libby vermiculite.

In summary, ATSDR's health studies have shown both common and rare associations of adverse health effects that are related to human exposure to hazardous substances. Some of these studies have found increases in the risk of birth defects, neurotoxic disorders, leukemia, cardiovascular abnormalities, respiratory and sensory irritation, and dermatitis. There are still many unfulfilled public health needs. Learning more about the occurrence of illness among people exposed to hazardous substances, the strength of these associations, and new ways to identify health effects at an early stage continues to be a challenge to ATSDR and the communities that it serves.