

# The Environment and Human Health: USGS Science for Solutions

Emerging infectious diseases, ground-water contamination, trace-metal poisoning ... environmental threats to public health the world over require new solutions. Because of an increased awareness of the issues, greater cooperation among scientific and policy agencies, and powerful new tools and techniques to conduct research, there is new hope that complex ecological health problems can be solved. U.S. Geological Survey (USGS) scientists are forming partnerships with experts in the public health and biomedical research communities to conduct rigorous scientific inquiries into the health effects of ecological processes.

## Partnering for Research

The mission of the USGS is to gather objective natural science information that policymakers can use to make decisions that assure a safe and sustainable future. To maximize efficiency in researching environmental health threats, the USGS is forging partnerships with many groups:

- Federal agencies
- State, Tribal, county, and local government organizations, including public health agencies
- Universities
- Nonprofit and nongovernmental organizations

## Linking the Environment and Human Health

USGS scientists are involved in many cooperative projects to study links between environmental factors and human health. Research by the USGS and its partners can support the development of effective prevention and mitigation strategies. Selected studies are described below.

### *West Nile Fever*

The study of West Nile fever, a potentially fatal viral encephalitis, is an example of using a systems approach to solve public health problems. West Nile fever is caused by a mosquito-borne virus that had never been reported in the Western Hemisphere until an outbreak in New York during the fall of 1999. West Nile fever is primarily a bird disease that can also infect mammals, including humans. USGS scientists have been testing dead birds for the presence of West Nile virus. The USGS also is researching the virulence of West Nile virus in crows and waterfowl (fig. 1). In addition, the USGS is coordinating a multistate surveillance network in collaboration with the U.S. Department of Agriculture, the U.S. Fish and Wildlife Service, the National Park Service, and State wildlife agencies. The data collected will be used to determine the geographic spread of the virus and possibly to predict future outbreaks.

### *Drinking Water*

USGS scientists, in cooperation with the Environmental Protection Agency (EPA) and other Federal, State, Tribal, and local government agencies, conduct research on fundamental hydrologic processes to help understand, manage, and protect our Nation's sources of drinking water. This work includes collecting and interpreting data on the distribution of contaminants and assessing the characteristics of the rivers, lakes, watersheds, and aquifers that are sources of drinking water. The USGS has found that low levels of pesticides and their degradates (which can disrupt hormone systems) are common in surface and ground water, in both agricultural and urban areas. Other drinking-water contaminants studied under the USGS National Water-Quality Assessment



Figure 1. USGS scientist studying American crows infected with the West Nile virus. American crows are highly sensitive to the virus, and analyses of infected crows indicate the spread of the virus since it appeared in the United States in 1999.



Figure 2. USGS scientist determining arsenic content of well water from the northeastern United States.

Program include arsenic (fig. 2), mercury, industrial waste, microbial pathogens, nitrates, pharmaceuticals, and radionuclides.

## ***Childhood Leukemia***

Building on work done by the USGS since the early 1990's, the Centers for Disease Control and Prevention and State and Tribal agencies are investigating possible causes of an unusual cluster of childhood leukemia cases in Fallon, Nevada. Naturally occurring uranium and arsenic in the municipal drinking-water supply may be contributing factors. The USGS is undertaking a comprehensive ground-water-quality investigation in the Fallon area that will provide much-needed information to help resolve this problem.

## ***Asbestos***

Asbestos is a commercial name for the fibrous variety of six silicate minerals, some of which may cause adverse health effects, such as lung cancer. There is concern about the potential health effects of asbestos minerals that occur in rocks (such as serpentinite, a common rock in many parts of the United States) or that occur with minerals used commercially (such as vermiculite and talc). Knowing the mineralogy properties and geochemistry of asbestos minerals may help mitigate the effects on human health. Questions about asbestos and human health are best answered by collaborative research between earth science and health



Figure 4. USGS scientists inspecting an air deposition station used to monitor the content of harmful particles and pathogens in transoceanic dust.



Figure 3. USGS scientists collecting soil samples at Libby, Montana, to check asbestos content.

professionals. For example, in cooperation with the EPA, the USGS is investigating the asbestos content of soils near Libby, Montana, where vermiculite was mined from 1921 to 1990 (fig. 3).

## ***Dust***

The USGS is investigating immense dust clouds in the upper atmosphere, detected by remote sensing, that move across oceans from Asia and Africa to the United States. Published estimates of African dust movement to the Amazon basin, the Caribbean, and the southeastern United States are on the order of hundreds of millions of tons annually. Movement of African dust to the Caribbean and the United States has increased dramatically since 1970 because of drought in North Africa. USGS analysis of dust collected at monitoring stations (fig. 4) shows that the dusts carry pesticides, heavy metals such as mercury and arsenic, naturally occurring radioactive isotopes, pollen, insects, miscellaneous organic debris, smoke, and pathogenic viruses, bacteria, and fungi. These constituents may kill Florida's coral, adversely affect water quality, and cause respiratory distress (asthma).

In addition, inhalation of dust containing spores of a fungal pathogen is known to cause valley fever. The USGS and cooperators are studying the distribution of this pathogen in the southwestern United States. The dust can be released by winds and by earthquake-triggered landslides.

## ***Arsenic in Coal***

In certain areas of China, villagers unknowingly use coal having dangerously high arsenic levels for heating and cooking. The USGS is collaborating on the development of a field test kit for arsenic that will allow villagers to identify coals unacceptable for domestic use.

## **Information**

For more information, please visit the USGS web site at [www.usgs.gov](http://www.usgs.gov) and the Environment and Human Health home page at [www.usgs.gov/themes/environment\\_human\\_health.html](http://www.usgs.gov/themes/environment_human_health.html).

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