ECOLOGICAL RESEARCH BENEFITS

The Hantavirus Case Study

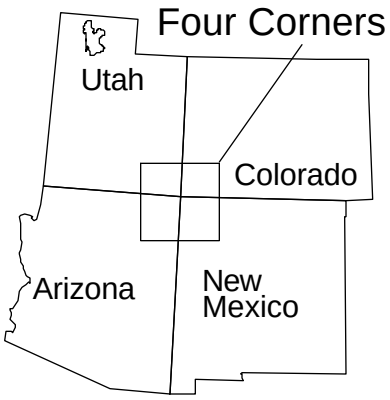
Though ecological research does not always show an immediate benefit, it may lead to important, and even life saving, applications. By giving us a better understanding of our environment, ecological data can help solve the social and environmental problems threatening the United States today. For example, in the case of the mysterious hantavirus oubreak in the southwestern United States, which caused over 45 human deaths from 1993-95, the benefits of a long-term ecological research project conducted on rodents were proven immeasurable. While the purpose of this research project was unrelated to disease prevention, having long-term data at their fingertips helped scientists quickly determine the cause of the hantavirus outbreak and how to prevent the spread of the virus. Such ecological studies are imperative to enabling decision makers to make informed choices concerning the health of our society and environment.

Outbreak!

Early in 1993, news reports begin to give accounts of a strange disease sweeping through the Four Corners area in Arizona, Colorado, New Mexico, and Utah. The death toll so far is at 13, with no known cause. This mysterious disease starts like the flu with fever, coughing, and chills. However, the victims of this disease die a painful death, their lungs filling with fluids. As fear sweeps the Southwest, the country wonders how quickly this disease will spread.

This was the situation when Hantavirus Pulmonary Syndrome (HPS) first appeared in the United States. Quick response by medical investigators from the Federal Center for Disease Control and Prevention (CDC) identified the Southwest outbreak as a new strain of the hantavirus, which had been previously reported in other countries. Once investigators this, the challenge became to find the cause of the sudden outbreak and how to stop it.

Investigating scientists with the CDC immediately suspected that, as with other hantaviruses, the likely carrier of the disease was a rodent. Preliminary tests conducted on rodents in the region indeed revealed the presence of the virus. However, scientists still had many unanswered questions. When did the transmission of the virus from rodents to humans first occur? How long had the virus been present in the region? How could future outbreaks be prevented? In order to answer these questions, scientists needed long-term ecological information on the native rodent population of the Southwest.



Cause of Mysterious Outbreak Discovered

In order to find the necessary ecological data, the CDC turned to the Sevilleta Long-Term Ecological Research (LTER) Program. Funded by the National Science Foundation in cooperation with the U.S. Fish and Wildlife Service, LTER held the only long-term data on rodent communities in the Four Corners region. The research program was able to provide a detailed demographic analysis for 22 rodent species inhabiting the area, revealing 10-fold population increases in various rodent species between 1992 and 1993. This population increase correlated with above-average precipitation during the spring of 1992, which led to higher rodent population densities. As a result, the probability of human-rodent-contact rose, resulting in an increase in virus transmission.

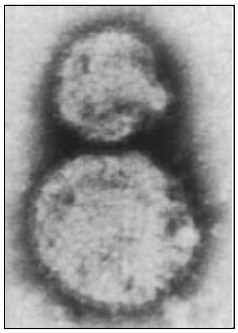
Scientists wanted to determine whether this strain of hantavirus was newly evolved, or had been in the region for years. The Sevilleta LTER had routinely collected museum specimens of rodents from all its study sites. By collecting tissue samples from these species, researchers found that the newly termed Sin Nombre hantavirus had been present in the rodent population for at least ten years before the 1993 epidemic.

Prevention of Future Outbreaks

Using the Sevilleta data, researchers are now attempting to predict the likelihood of another outbreak. Continued data collection will aid scientists in monitoring rodent population increases and movement. This information is also helping scientists develop disease prevention plans and assess the effectiveness of control measures used to reduce human-rodent contact.

What is the Hantavirus?

Although commonly known as the hantavirus, the virus which caused an outbreak in the southwestern United States in 1993 is actually called the Sin Nombre virus. It is a member of a family of hantaviruses, first identified as the Hantaan virus after it caused mysterious disease and deaths of thousands of United Nations troops during the Korean War. Unlike previously identified hantaviruses, which cause kidney failure, this newly identified strain causes respiratory failure and is much more deadly. Other strains of hantavirus have been identified in California, Florida, Louisiana, and New York.



The Hantavirus

Symptoms

Flu-like symptoms with fever, chills, muscle pain, and cough. This is followed by acute respiratory failure where the capillaries in the lungs leak fluids, causing the victim to drown. These symptoms, called Hantavirus Pulmonary Syndrome (HPS), have a mortality rate of 50%. Death is swift and painful within days of the first signs of illness.

Host

Rodents are the primary carrier of hantaviruses. Each hantavirus appears to "prefer" different rodents and data suggest that the strain found in the Four Corners area prefers the deer mouse. The virus does not cause any apparent illness in the rodent host.

Transmission

The virus can be transferred from the rodent to humans via saliva, urine, and fecal material. Human infection may occur when the materials are inhaled as aerosols or introduced directly onto broken skin. Known cases of hantavirus are associated with planting or harvesting crops, cleaning barns, residing or visiting areas with a high rodent population, hiking or camping in rodent-infested areas, or inhabiting dwellings with indoor rodent populations.

Treatment

Currently, no treatment is available. However, there are two drugs which are being clinically tested, Ribavirin and Bradycor. Ribavirin, used in other parts of the world to treat viral infections such as hepatitis and herpes, seems to decrease mortality and duration of symptoms in severe hantavirus cases if given within five days of disease onset.

Timeline of the Hantavirus Crisis

Through the cooperative effort of ecologists, virologists, and medical doctors, scientists identified the deadly virus and the species that transmits it within a month. Scientists were able to identify the cause of the outbreak and educate people on how to avoid contracting the virus.

May 14, 1993 — A young man collapses on the way to his fiancee's funeral and is rushed to Gallup Medical Center Emergency Room in the Four Corner's area of New Mexico. He dies hours later of unknown causes. State medical investigators perform an autopsy on the man and his fiancee, noting the similarity in symptoms.

May 17, 1993 — Gallup Medical Center officials link the couple's death to three other respiration fatalities. A warning is sent to the New Mexico Department of Health.

May 18, 1993 — The New Mexico Department of Health contacts the Center for Disease Control (CDC), which begins to investigate.

June 4, 1993 — CDC positively identifies the cause of death as a never-before-seen strain of hantavirus.

June 14, 1993 — CDC verifies that the deer mouse is the carrier of this hantavirus strain. CDC turns to ecological researchers to determine why the outbreak is occuring. Ecological data show that the outbreak coincided with a deer mouse population explosion.

Currently — While the hantavirus itself has not been eradicated, further ecological research will help predict future outbreaks.

For more information on health issues related to the hantavirus, please contact:
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For more information on the scientific research related to this issue, please contact the Ecological Society of America at the address listed below.

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