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Prepared by Laura H. Kahn, MD, MPH, MPP - Bruce Kaplan, DVM - Thomas P. Monath, MD

“ONE HEALTH” ... in Action! [#4]

By Peter M. Rabinowitz, MD, MPH

In the spring of 1979, an unusual epidemic of anthrax occurred in the city of Sverdlovsk, 1400 miles east of Moscow. Soviet medical authorities reported that the epidemic was linked to an outbreak of anthrax among livestock in the area, and that the human cases were due to people eating contaminated meat and having skin contact with contaminated animal carcasses. The size of the human epidemic, however, led to international speculation whether it was natural or accidental, and if accidental whether it was due to activities in violation of the Biological Weapons Convention of 1972. After repeated attempts to bring independent scientific teams to Sverdlovsk, permission was granted for a scientific team to visit, and the investigation took place in 1992 and 1993.

The investigative team, led by the noted American geneticist, molecular biologist and Harvard biochemist, Matthew S. Meselson, PhD, included Jeanne Guillemin, PhD, noted author/sociologist/medical anthropologist, Alexis Shelokov, PhD, a vaccine expert from the Salk Institute with a long career in public health, David Walker, MD, well known University of Texas Medical Branch pathologist, and renowned veterinary medical epidemiologist Martin Hugh-Jones, DVM, MPH, PhD. In her *book, Dr. Guillemin said, “The veterinary perspective is essential. Anthrax is a zoonosis, a disease that can travel from animals to humans. It is almost always associated with grazing animals, especially sheep, cows, goats, and horses that pick it up from contaminated soil, by either eating or inhaling the tough spores that are the dormant form of its deadly bacteria.” The legendary human medical epidemiologist, Alexander D. Langmuir, MD was involved in deciphering data for publication.

From the beginning, the team took a “One Health” approach with human medicine and veterinary medicine professionals working side by side to investigate both human and animal cases of anthrax that had occurred.

Since the KGB had apparently destroyed hospital and public health records of the outbreak, the team had to locate (using government compensation lists) and personally interview survivors as well as family and friends of anthrax cases, search local cemeteries, and comb through hospital autopsy reports and individual case histories. They also searched reports from veterinary laboratories and interviewed owners of sheep and other livestock that had died. Through this painstaking process, they were able to analyze 77 human cases, and establish that most of them lived and worked in the southern part of the city.

The clinical histories of anthrax victims suggested that many of them had become sick through inhalation of anthrax spores, not eating contaminated meat as the government had claimed. The apparently 4 km long area where cases were clustered was downwind from a military microbiology laboratory that had officially been developing an improved anthrax vaccine at the time of the outbreak. This seemed to provide evidence that an accidental release of anthrax from the military facility had caused the human outbreak. At the same time that this human epidemiological work was proceeding, the team was investigating animal cases of anthrax in the Sverdlovsk area during the same period.

They found that in six villages located to the south (downwind) of Sverdlovsk, including one village 50 km south of the area of human cases, sheep and cows started dying at around the same time that human cases were appearing. In those same towns, there were no reported human cases. Together with the human data, these animal case findings further supported the hypothesis that there had been a single release of anthrax spores from the military facility that had drifted south, causing the largest documented outbreak of human inhalation anthrax.

The fact that animals died in an area almost 50 km from the nearest human case provided key information about the movement of the airborne anthrax spores and showed that there was exposure risk over a much greater area than would have been expected without the animal data. It also indicated that sheep may be more susceptible than humans since they apparently became sick and died at exposure levels an order of magnitude lower than where human cases occurred. In this way, the animal deaths served as “sentinel events” providing warning information to humans about an environmental health hazard, in this case a pathogen that is a prime bioterrorism agent.

The success of the “One Health” approach used in this investigation underscores the urgent need for human and veterinary medical health professionals to work cooperatively on “shared risk” issues from bioterrorism agents, most of which are zoonotic in origin. Physicians, a veterinarian and allied health scientists worked synergistically in tandem!

The findings of the team’s investigation were published in *Science* (Meselson M, Guillemin J, Hugh-Jones M, Langmuir A, Popova I, Shelokov A, Yampolskaya O. The Sverdlovsk anthrax outbreak of 1979. *Science*. 1994; 266(5188):1202-8 and **Anthrax: The Investigation of a Deadly Outbreak* by Jeanne Guillemin, University of California Press, 1999.