

Addressing Outbreaks of Foreign Infectious Disease: It's No Monkey Business

A Case Study in Assessment

Mid-America Regional Public Health Leadership Institute Year 12 Fellows

Indiana Team #2-Peppers 2004

Robert Allen, MPA, Field Epidemiologist-Indiana State Department of Health

Katheryn Brigham, BA, Legislative Liaison-Indiana State Department of Health

Sandy Cummings, MS, Chronic Disease Coordinator (Mentor)-Marion County Health Department

Judith Gilliland, BSEd, MPA, Public Health District Coordinator-Indiana State Department of Health

ReBecca Lair, BSW, Public Health District Coordinator-Indiana State Department of Health

Dana Stidham, MS, Public Health Education Coordinator-Indiana Public Health Association

On April 9, 2003 a plane arrived in Texas from the African country of Ghana, carrying a cargo of approximately 800 animals housed in close confinement. The crew delivered the animals to a Texas animal distributor to be sold in pet stores across the United States. Among the animals transported were prairie dogs (*Cynomys* sp.), Gambian rats (*Cricetomys* sp.), rope squirrels (*Funisciurus* sp.) and dormice (*Graphiurus* sp.)¹. Shortly after the plane's arrival the animals were shipped to different parts of the country. The rope squirrels were moved to Massachusetts, where they later died of natural causes or euthanasia. However, the dormice and prairie dogs survived and were sold to a pet store in Illinois called Randy's Exotic Pets.² Unbeknown to the cargo pilots or to the pet store owners, an acute orthopox virus lay dormant in these animals and was about to unleash a disease upon the unsuspecting populous of mid-America. It took the combined efforts and communication between local, state and federal public health agencies to suppress the first known cases of monkey pox in the continental United States. This case study describes the story of one individual's encounter with the disease, and it outlines the cooperation between different public health agencies. Also, it addresses how well those agencies interacted with each other in order to assess the threat of outbreaks of infectious disease.

Narrative

In mid-May, the state of Indiana held its monthly Reptile Round-Up in Central City, IN. Several of the participants traveled from neighboring states to peddle unusual or exotic animals as pets to local patrons. This year Randy R. Dent, owner of Randy's Exotic Pets, brought his collection of newly imported animals to the show. A 35 year old woman, Monica Keys of Smalltown, Indiana purchased one prairie dog to add to her eclectic array of pets.

On May 19, the day after the Reptile Round-Up, Monica decided to display her latest pet by bringing it to a show-'n'-tell at the West Smalltown Elementary School to a

¹ The scientific classification names were derived from the reference titled "Fact Sheet: Embargoed Animal and Monkeypox Virus."

² The interview with Dr. Norman provided the referenced information.

group of first graders. Although the children were intrigued with the animal, neither the students nor the teacher touched the prairie dog. After visiting the school, Monica went to her job at a local convalescence center to speak with her supervisor. While she was there, only the supervisor saw the prairie dog.

A week later, during a routine feeding, the prairie dog was startled and bit Monica's right index finger. It left a small puncture in the skin. At the time, Monica did not seek medical treatment from her physician since it was not a serious injury, and the animal seemed healthy. However, four days later, on May 29, Monica noticed that one of the prairie dog's eyes was matted together. Within two days, Monica noticed a significant change in the animal's appearance and behavior. She recognized that the animal appeared to be lethargic, and no longer ate or drank. Its matted eye was now infected with puss, and bulging tumors were under its skin. A rash was developing over a large portion of its body with lesions under its chin.

On Monday, June 2, Monica ran a fever and did not come in to work. Over the next two days, Monica began coughing and her highest fever temperature ran at 103.2 F. During her sick leave, Monica decided to work in her garden. While she was working Monica felt a sharp pain in her right index finger, and assumed she had a cactus spine stuck in her finger. She later made an appointment with her physician for that Thursday. Her doctor lacerated the wound and found nothing. He then prescribed Augmentin. The next day, on June 6, Monica went to check on the prairie dog's status and found the animal dead. On the same day she buried the animal in the backyard of her residence along with its cage and related items.

After the animal's death, Monica's symptoms worsened, indicating the presence of serious illness or infection. She complained of having high fever, cough, headache, myalgia, sore throat and sweats. By the end of the week, on June 8, Monica developed a blistering rash that began on her right hand and later spread to the rest of her body.

Throughout Indiana and the nation, the media informed the public of the findings from the Centers of Disease Control and Prevention (CDC) and that the suspected cases of monkey pox were associated with the Central City Reptile Round-Up. Local news organizations also disseminated information that the disease could be contracted from close contact with prairie dogs.

After hearing the news reports, Monica's sister informed her that her condition might be related to monkey pox. On June 9, the rash on Monica's body was more pronounced and she later notified her physician of her illness. Monica's doctor discovered that her rash took on different appearances. She developed a macular, papular, vesicular and pustular rash. It appeared on her upper and lower torso but mostly on her hands, arms and legs. Monica's other symptoms persisted, while the infected area on her hand formed cellulites on the ring finger and necrotic on the index finger.

Once Monica was diagnosed with lymphadenopathy and lymphangitis, her physician notified the local health department of a possible case of monkey pox. Monica was admitted to a local hospital in an isolation room, where the hospital staff took every necessary precaution for handling an infectious disease. The hospital immediately treated Monica with a regimen of medication.

The physicians prescribed Monica with a Tetanus booster and started a rabies immune globulin and rabies vaccine for the onset of symptoms. They also administered

Zosyn, Cipro and continued doses of Augmentin. The hospital kept her under close supervision and prepared a number of tissue samples and photos of her lesions to be sent to the CDC for further evaluation. The samples included the roof of one lesion, a formalin and unpreserved lesion. Also, two biopsy slides, a tube serum and a questionnaire and assessment form were sent.

When the samples reach the CDC, there is an established laboratory criteria set in place to determine the presence of a disease. The virus must be isolated in a culture and its DNA must be tested in a clinical specimen by polymerase chain reaction. In order to determine the virus morphology, the sample must be consistent with an orthopox virus by electron microscopy in absence of exposure to another orthopox virus.

Finally, CDC labs determine the presence of an orthopox virus in a tissue sample by using immuno-histochemical testing methods without the exposure from another orthopox virus.³

On June 17, a state health official and Dr. John Doolittle, monkey pox research specialist for the CDC, visited the local hospital after reviewing Monica's tissue samples. Under closer examination of Monica's lesions, Dr. Doolittle immediately diagnosed her with monkey pox. Even though Dr. Doolittle pronounced Monica as a positive confirmation for monkey pox, she began to recover from many of her symptoms and was released from the hospital. The hospital physicians instructed her to sequester herself at home until all of the lesions disappeared.

Two days later, state and federal public health officials recommended the smallpox vaccine, another orthopox virus, for any individual who was exposed to monkey pox. Monica's personal physician and his nurse declined to receive the vaccine since the incubation period already passed; vaccinations should be administered within four days of exposure.⁴

On July 3, the CDC released another update revealing the suspected source of monkey pox outbreaks in the United States. Public health officials determined a positive confirmation of the virus in a Gambian rat, three dormice, and two rope squirrels. These animals were part of a shipment of rodents from Africa that were transported to the United States on April 9. The update explained that the CDC received information on 81 suspected cases and further investigations would continue.⁵

In Indiana, state and federal health officials contacted all involved entities for follow-up assessment. They concluded that no further investigations were required since no new cases were reported.

Agencies

³ Cited from the document titled "Interim Case Definition for Animals and Monkeypox Virus."

⁴ All details concerning the patient's contact with the animals, her illness, treatment and hospitalization were taken from the data collection questionnaire Version 2.9, June 2003.

⁵ Cited from the press release titled "CDC Confirms Monkeypox in Rodents Interim Recommendations Aim to Curb Further Spread."

In the weeks that passed between Monica's purchase of the prairie dog to her initial signs of illness, the first human cases of an unknown disease with similar symptoms were discovered in Meadows, WI at the Meadows Clinic. The clinic immediately contacted the CDC. Later, on June 7, the CDC issued a statement in a press release that identified the disease as monkey pox.

The CDC indicated that there were 17 cases in Wisconsin, one in Illinois and one in Indiana. All of the patients claimed to have become ill after close contact with an ill prairie dog.⁶ Public health officials explained that monkey pox is a rare zoonotic, viral disease occurring primarily in rain forest countries of Central and West Africa. First noted in African monkeys in 1958, monkey pox is also found in many other animals, including some rodent species and lagomorphs. After an incubation period of 12 days, infected humans exhibit symptoms of fever, cough, headache, myalgia and rash.⁷

As the CDC's investigations yielded new information about monkey pox, the agency provided continuous updates on general information about the disease, recommended treatment, and the number of cases and the initial point of contact within the United States.

In Indiana, state public health workers served as liaisons between local health departments, hospitals and the field staff teams from the CDC. They collaborated to investigate suspected and confirmed cases, and they helped identify animal-to-human transmission of the disease. The State Board of Animal Health (BOAH) also played an integral role in the investigation. In addition to helping to provide CDC guidance to locals, BOAH provided information that traced the disease's point of origin. The BOAH also uncovered the transportation route of the animals from Texas to the Mid-West, and parts of New England.⁸

On June 11, the Director of the CDC and the Commissioner of the Food and Drug Administration (FDA) issued a joint order, under 42 CFR 70.2 and 21 CFR 1240.30, prohibiting until further notice, the transportation or offering for sale, or offering for any other type of commercial or public distribution, including the release into the environment of prairie dogs, tree squirrels, rope squirrels, dormice, Gambian giant pouched rats, brush-tailed porcupines, and striped mice. This included disposing euthanized animals in landfills. The immediate embargo on the importation of all rodents from Africa was implemented to reduce and/or eliminate the release of other animals that might carry monkey pox.

Also, that same day in a press release, the CDC recommended the use of the smallpox vaccine to protect individuals who had been exposed to monkey pox. However, the press release explained that the smallpox vaccine is not approved for monkey pox. It was "being distributed under FDA special procedures to allow such emergency use in association with individual patient informed consent and approval by an institutional review board."⁹

⁶ Cited from the press release titled "Public Health Investigation Uncovers First Outbreak of Human Monkeypox Infection in Western Hemisphere."

⁷ Information from this reference was also used to cite the date and Code of Federal Regulations that was issued by the CDC and FDA.

⁸ The data cited here is provided by the document titled "Memorandum RE: Monkeypox."

⁹ This information is cited from the press release titled "CDC Recommends Smallpox Vaccination to Protect Persons Exposed to Monkeypox."

Closing

In some disease outbreak situations, communication between entities is not fluid or there may be a breach in policy enforcement. However, this was not the case with the monkey pox outbreak in Smalltown, IN. Public health workers at every level from first responders to agency administration proved they had the capabilities to identify, and eliminate a foreign health threat. In order to accomplish this, public health agencies on various levels had to cooperate with each other. They were able to rapidly collect and analyze sensitive information, and then disseminate it to the public in a timely and accurate manner.¹⁰

According to federal foreign quarantine regulations, carriers entering a U.S. port “will not undergo inspection unless the Director determines that a failure to inspect will present a threat of introduction of communicable disease into the United States.”¹¹ However, carriers from a foreign origin must submit to sanitation inspections “to determine whether there exists rodent, insect, or other vermin infestation, contaminated food or water, or other unsanitary conditions requiring measures for the prevention of the introduction, transmission or spread of communication disease.”¹² This may provide an explanation as to why the imported animals were not detained, and furthermore the prairie dogs did not begin to show signs of infection until weeks after their arrival.

The integrity of our infrastructure will always be challenged by the presence of public health threats, but it is how well every branch of public health assesses information to initiates responses that will help to ensure the safety of our communities.

¹⁰ Referred to the Institute of Medicine, Committee on the Future of Public Health.

¹¹ 42 CFR 71.31

¹² 42 CFR 71.41

Study Questions

1. Who should oversee this assessment and who would be participating or cooperating as a team?
2. What components of a strong public health infrastructure should would be in place to contain this disease?
3. What leadership characteristics would have been displayed in this scenario?
4. What kind of economic impact did this incident pose on animal importation and the exotic pets industry?
5. In the Smalltown, Indiana incident, the disease transmission was from animal-to-animal and animal-to-human. What if the disease affected the wild prairie dog species of the American West and Southwest? If the incident had occurred in New York City, how would this have impacted the human and rodent populations? How important is it to involve our local veterinarians in our preparedness plans since animals play a key role in many families and can be carriers of certain diseases?
6. How important is the role of the media in public health infrastructure?
7. What conclusions can be made about expediency and documentation of assessment and its influence upon implementing or developing the necessary policies to prevent further contamination of people and the animal population? How about the influence of assessment on policy development?

References

1. CDC Monkeypox. Fact Sheet: Embargoed Animals and Monkeypox Virus. 4 Nov 2003. Centers for Disease Control and Prevention. 10 Dec. 2003 <http://www.cdc.gov/ncidod/monkeypox/factsheet>.
2. Norman, Sandi DVM. Phone interview with the Indiana Board of Animal Health. Dec. 2003.
3. CDC Monkeypox. Interim Case Definition for Animal Cases of Monkeypox. 10 Jun. 2003. Centers for Disease Control and Prevention. 10 Dec. 2003 [http:// www.cdc.gov/ncidod/monkeypox](http://www.cdc.gov/ncidod/monkeypox).
4. LaMar, Carolyn RN 2003. Monkeypox outbreak associated with Prairie Dogs: Data Collection questionnaire, Version 2. 9 Jun. 2003. Local Health Department. Vigo County, IN.
5. Centers for Disease Control and Prevention Media Relations. CDC Confirms Monkeypox in Rodents Interim Recommendations Aim to Curb Further Spread. 3 Jul 2003. Office of Communication Media Relations for the Centers for Disease Control and Prevention. 18 Dec. 2003 <http://www.cdc.gov/od/oc/media/pressrel/r030607.htm>.
6. Centers for Disease Control and Prevention Media Relations. Public Health Investigation Uncovers First Outbreak of Human Monkeypox Infection in Western Hemisphere. 7 Jun. 2003. Office of Communication Media Relations for the Centers for Disease Control and Prevention. 18 Dec. 2003 <http://www.cdc.gov/od/oc/media/pressrel/r030611.htm>.
7. Rules and Regulations, Federal Register. Control of Communicable Disease Restrictions on African rodents, prairie dogs and certain other animals. 4 Nov. 2003. Government Printing Office. 2 Dec. 2003 <http://frwebgate.access.gpo.gov/cgi-bin/multidb.cgi>
8. Marsh, Bret D. DVM and Wilson, Gregory A. MD. "Memorandum RE: Monkeypox." E-mail to the Office of the Governor. 9 Jun. 2003
9. Centers for Disease Control and Prevention Media Relations. CDC Recommends Smallpox Vaccination to Protect Persons Exposed to Monkeypox. 11 Jun. 2003. Office of Communication Media Relations for the Centers for Disease Control and Prevention. 18 Dec. 2003 <http://www.cdc.gov/od/oc/media/pressrel/r030702.htm>.
10. Institute of Medicine, Committee on the Future of Public Health, The Future of Public Health, Washington, DC: National Academy Press, 1988.
11. Code of Federal Regulations. Foreign Quarantine; Health Measures at U.S. Ports: Communicable Diseases. 11 Mar. 2004. Government Printing Office. 1 Oct. 2003 <http://frwebgate.access.gpo.gov/cgi-bin/get-cfr.cgi>
12. Code of Federal Regulations. Foreign Quarantine; Requirements Upon Arrival at U.S. Ports: Sanitary Inspection. 11 Mar. 2004. Government Printing Office. 1 Oct. 2003 <http://frwebgate.access.gpo.gov/cgi-bin/get-cfr.cgi>