ISSUE REPORT

Trust for America's Health

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ANIMAL-BORNE EPIDEMICS OUT OF CONTROL: Threatening the Nation's Health

For centuries, humans have been afflicted with diseases that originate in animals. Many of the agents responsible for epidemics throughout human history have their origins in animals: tuberculosis, influenza, bubonic plague, foodborne illness, and AIDS. Episodes of animal-borne diseases, also referred to as zoonotic diseases or zoonoses, are increasing around the globe.[1] Exotic sounding ailments, including severe acute respiratory syndrome (SARS), monkeypox, West Nile virus (WNV), mad cow disease, Lyme disease, and chronic wasting disease (CWD), a fatal disease affecting deer and elk, have been capturing global headlines. Some scientists expect the rise in zoonotic disease episodes to continue.[2]

Despite the surge in animal-borne diseases threatening Americans, the country lacks a concerted national program to *prevent and control* these illnesses, which can impact humans, animals, and food, in the U.S. and abroad. There is no strong, coordinated effort or a single federal agency with *command and control* responsibility for managing this growing nationwide health problem. The Centers for Disease Control and Prevention (CDC) has developed a plan to address animal-borne diseases, but has not received adequate resources to implement the plan.[3]

So, the U.S. is left with a myriad of bureaucratic jurisdictions that respond to various aspects of the diseases, with little coordination and no clear plan for communicating with the public about the health threats posed by animal-borne diseases. This is especially troublesome given that many of the potential agents for biological weapons are zoonotic.[4] For instance, anthrax, which can be weaponized, has historically been passed from the soil to farm animals to humans.[5]

This report examines the public health response to five of these emerging animal-borne diseases: monkeypox, WNV, mad cow disease, Lyme disease, and CWD, and concludes that the *de facto* U.S. policy to animal-borne disease management has been a general evolution toward cross-agency and interstate task forces as the diseases progress over time. Yet, the initial *ad hoc* approach to these health threats delays the development of strong, proactive response and containment plans. Meanwhile, the diseases continue to spread, in growing numbers.

TRUST FOR AMERICA'S HEALTH IS A NON-PROFIT, NON-PARTISAN ORGANIZATION DEDICATED TO SAVING LIVES BY PROTECTING THE HEALTH OF EVERY COMMUNITY AND WORKING TO MAKE DISEASE PREVENTION A NATIONAL PRIORITY.

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Consider this. Of the diseases reviewed in this report:

- The monkeypox virus entered the U.S. through imported Gambian giant rats sold in the nation's under-regulated exotic pet trade. The rats infected pet prairie dogs, which passed the virus along to humans. The outbreak sheds light on the lack of coordinated federal oversight to prevent future zoonotic disease outbreaks, as well as the confusing state and federal laws that govern exotic pet trade.
- Despite the relatively successful efforts of the public health community to raise awareness about Lyme disease, it is now endemic to the U.S. and the number of cases has grown significantly. The Centers for Disease Control and Prevention (CDC) reported 17,730 cases in 2000, the last year data were available. This number represents a notable 28.11 percent increase from the yearly average of 12,745 Lyme cases reported from 1991-2000.[6]
- In the case of West Nile virus, the pathogen was discovered in the U.S. for the first time in New York City in 1999, where it sickened 62 people, killing seven of them. The U.S. General Accounting Office (GAO) found that while aspects of the outbreak investigation worked well, the "lack of leadership in the initial stages" and the lack of communication channels among the many agencies involved prevented information from being shared efficiently.[7] Rapid and reliable communication between public and animal health agencies is essential to preparedness and coordination. The ability to disseminate and share information quickly helps ensure decisions are made with the most current information.
- The economic impact of mad cow disease[8] in Great Britain has been devastating. One estimate sets the cost of eradication and interventions to support farmers and markets at over $5 billion (£3.2 billion) from 1989 through 2000.[9] Although mad cow disease has not yet made an appearance in the U.S., the ability of the fragmented food safety system to permanently prevent its entry is uncertain. If the disease were found here, experts predict that the economic impact on the $56 billion beef and related industries could be overwhelming.[10]
- Chronic wasting disease (CWD) is a fatal disease striking deer and elk. Left unmanaged, the disease could potentially devastate deer and elk populations, and incur major economic loss for state governments and private businesses that rely on hunting for revenue.[11] There appears to be cooperation and coordination among public and animal health officials in the federal government, and between the states and federal government with respect to CWD. However, because it continues to be viewed as primarily a wildlife health issue, sufficient funding is lacking to fully control the disease.

Why Are Animal-Borne Epidemics Increasing?

Humans who come in contact with infected animals or disease vectors[12] risk contracting a "zoonotic" disease that the animal may be carrying. The opportunities for such contact are growing steadily:

- Human and farm animal populations are increasing around the world, and in some areas like Southeast Asia, this is bringing more humans and animals into close contact.
- People are moving into parts of the world where humans have never lived before, exposing themselves to unknown infectious agents.
- Air travel and cargo ships allow an infectious person or animal to reach far flung parts of the globe in less time than the incubation period of many pathogens.

- Importing exotic animals for pets also increases the opportunities for the spread of zoonotic disease.
- Overlapping animal migration routes introduce birds and other animals into new geographic areas, along with the infectious agents they harbor.

The emergence of SARS illustrates how humans can contract diseases through contact with animals.[13] In China, restaurant workers and other individuals handling mongoose-like animals called civets acquired the illness from these animals, which are consumed as food. Many public health officials now speculate that the virus causing SARS likely jumped from the civets to humans as the animals were handled in markets and during meal preparation.[14] These individuals fell ill and infected others with the disease. From markets and kitchens in China, the virus was carried by infected people traveling to North America, Europe, South America, and Africa. Similarly, the AIDS virus is thought to have entered the human population when hunters in central Africa killed monkeys for food that carried a closely related virus.[15]

Monkeypox

Monkeypox is an infectious, viral disease endemic to Central and Western Africa. In early June 2003, officials in several Midwestern states reported the first human cases of monkeypox contracted in the United States. As of July 2, 2003, over 80 cases of possible monkeypox have been reported in six states: Wisconsin, Indiana, Illinois, Missouri, Ohio, and Kansas. More than 30 of these have been confirmed as monkeypox.[16]

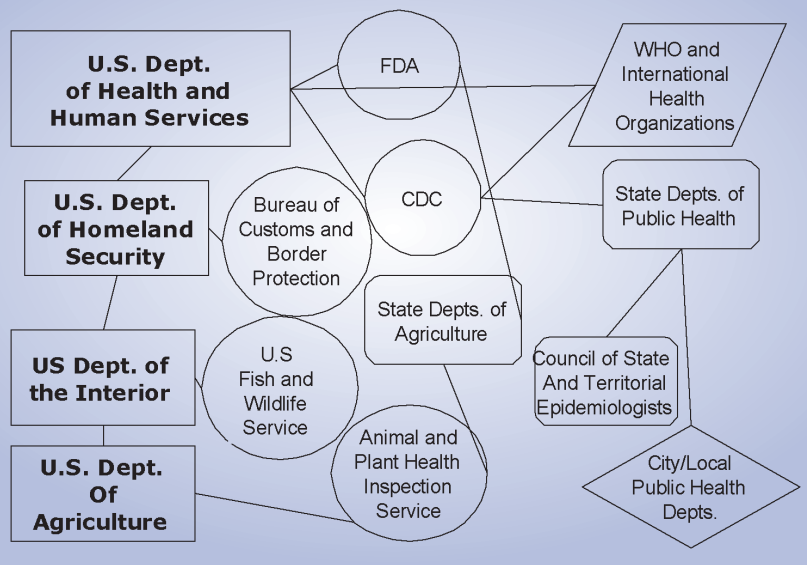
The monkeypox virus was first discovered in African laboratory monkeys in 1958, hence the name. It belongs to the same *orthopoxvirus*[17] group of viruses as smallpox, though it is less communicable and less fatal. Human monkeypox outbreaks in Africa, first documented in 1970, typically produce a fatality rate ranging from one to ten percent.[18] In the recent domestic outbreak, none of the cases have resulted in death. In past African outbreaks, a weakened form of the virus has spread from person-to-person. In the current U.S. outbreak, however, no one infected is believed to have contracted the virus from another human.

Humans become infected through a bite or contact with an infected animal's blood, body fluid, or lesions.[19] People infected with the monkeypox virus report a range of symptoms, including: fever greater than 99.3°F, headache, muscle ache, backache, chills, cough, swollen lymph nodes, and exhaustion.[20] The illness lasts two to four weeks. Within one to ten days of the onset of fever, a rash characterized by raised bumps and lesions develops, often on the face and trunk. The monkeypox lesions then break open and produce scabs or scars, similar in appearance to smallpox and chickenpox scars. The incubation period ranges from one to three weeks.[21] Currently,the vaccine used for smallpox is 85 percent effective in preventing monkeypox. CDC has recommended that individuals who have had close or intimate contact with individuals or animals with the disease should be vaccinated with the smallpox vaccine.

The Public Health Response to Monkeypox

On May 22, a young child in Wisconsin visited her physician, exhibiting symptoms consistent with an *orthopoxvirus*. The child had a high

AGENCIES AND ORGANIZATIONS INVOLVED IN MANAGING MONKEYPOX



fever and a sore throat that developed after she was bitten by her pet prairie dog. While this was a complex diagnostic determination, the local health department and CDC were not notified until June 4 — 13 days later.[22] This gap delayed the activation of the Emergency Operations Center at CDC, an agency of the U.S. Department of Health and Human Services (HHS). The Emergency Operations Center is responsible for receiving reports of suspected infectious disease outbreaks and launching investigations.

The National Center for Infectious Diseases (NCID), a center within CDC, assumed federal responsibility for the monkeypox investigation and management. CDC then worked in coordination with state and local public health departments in places where they suspected potentially infected people. CDC interacts with most of these health departments on a cooperative, voluntary basis, but does not generally dictate how a jurisdiction manages disease outbreaks within their local borders. Each state impacted was responsible for dealing with the disease outbreak in its own way. For example, in Wisconsin, the Division of Public Health investigated reported cases of monkeypox. The agency also used its authority to quarantine several individuals infected, most notably the child, who had been bitten by her pet prairie dog, and her family. In Illinois, as of July 2, 2003, the Department of Public Health had been investigating 16 confirmed and possible cases.[23]

Complications in the investigation escalated when a connection was made between the disease and pet prairie dogs, specifically a set of pet prairie dogs that were housed with a variety of imported rodents, including Gambian giant rats, which also were being sold as exotic pets. These rodents are suspected to have carried the monkeypox virus from West or Central Africa.

While CDC has jurisdiction over national disease control and prevention, it generally does not have the authority to regulate animals, agriculture, or food. An effort comprised of industry, government, and academic institutions operate a system to address emergencies animals face such as floods, drought and, infectious agents — the National Animal Health Emergency System. However, there is no corresponding proactive rapid response vehicle to call upon to coordinate health threats that cross both humans and animals. Instead, the federal Agriculture, Interior, and Homeland Security Departments, along with their state and local counterparts, each had to respond to different animal, wildlife, trade, and security issues, to supplement the efforts of HHS, CDC, and the FDA. The U.S. Department of Agriculture's (USDA) Animal

and Plant Health Inspection Service (APHIS) helps regulate the exotic pet trade and was called in to investigate the movement of the suspect prairie dogs and Gambian giant rats.

On June 11, 2003, HHS imposed a nationwide ban on importing certain rodent species from Africa, and prohibited the distribution, sale, or transport of prairie dogs and six rodent species within the United States.[24] CDC and the FDA are in charge of these embargoes, but cannot functionally enforce the ban without support from the Bureau of Customs and Border Protection, part of the U.S. Department of Homeland Security, and the U.S. Fish and Wildlife Service, a division of the U.S. Department of the Interior.[25]

The states with suspected monkeypox cases then had to devise their own animal containment response. There is a relative paucity of laws governing exotic pet trade. In addition, these laws vary greatly from state to state.[26] While two states, Georgia and California, have fairly comprehensive laws governing the exotic pet trade, most other states do not.[27]

Efforts to control monkeypox spanned across the local, state, and federal agencies responsible for the health of communities, for agriculture, for animal inspections, and for monitoring exotic pet trade and commerce. In total, four federal Cabinet Departments, five federal agencies, and the corresponding departments in each of the impacted states and communities patched together monkeypox containment solutions.

Since the carriers of the virus were found and contained relatively quickly, the human outbreak was able to be largely controlled. Testing wild rodent populations is ongoing to detect whether virus has become established in domestic or wildlife animals. However, if monkeypox were a more virulent and contagious virus, the lack of an effective human-animal disease management strategy likely would have led to more tragic results.

West Nile Virus

West Nile virus (WNV), first identified in Uganda in 1937, infects mosquitoes, birds, humans and horses. WNV is a type of virus that causes encephalitis, or inflammation of the brain. The virus has been confirmed in Africa, Western Asia, the Middle East, the Mediterranean region of Europe and, since 1999, in North and Central America.

WNV exists through a transmission cycle involving mosquitoes and birds. Mosquitoes become infected with the virus when they feed on infected birds, which carry the virus in their blood. Infected mosquitoes can then transmit WNV to humans and animals when biting. Testing for the virus in humans involves collection of blood and cerebrospinal fluid to determine the presence of antibodies to the virus. The incubation period is generally two to 15 days from the time a mosquito carrying WNV infects an individual.

In people, most infections produce no symptoms, or mild to moderate symptoms. An estimated 20 percent of people infected will develop West Nile fever. Symptoms may include headache, fever, and body aches, often with skin rash and swollen lymph glands. More severe infections may be marked by high fever, neck stiffness, muscle weakness, stupor, disorientation, convulsions, paralysis, coma, and, rarely, death. The elderly and individuals with weakened immune systems are most likely to develop severe illness associated with

WNV. In 2002, 4,156 people developed West Nile fever and 284 died from the illness.[28] As of July 28, 2003, Texas had reported nine human cases of West Nile virus; Colorado, Florida, and South Dakota had reported four human cases each; and Alabama, Iowa, Minnesota, Ohio, and South Carolina had reported one human case each.[29] The sole human death attributed to WNV so far in 2003 has been an Alabama resident.[30]

In 2002, there were rare cases of West Nile virus infections transmitted to people by blood transfusions, and even rarer cases of organ transplant, breast milk and intrauterine transmission. Virtually all of the nation's blood supply is being tested for WNV. Targeted testing of transplant tissue is planned.[31]

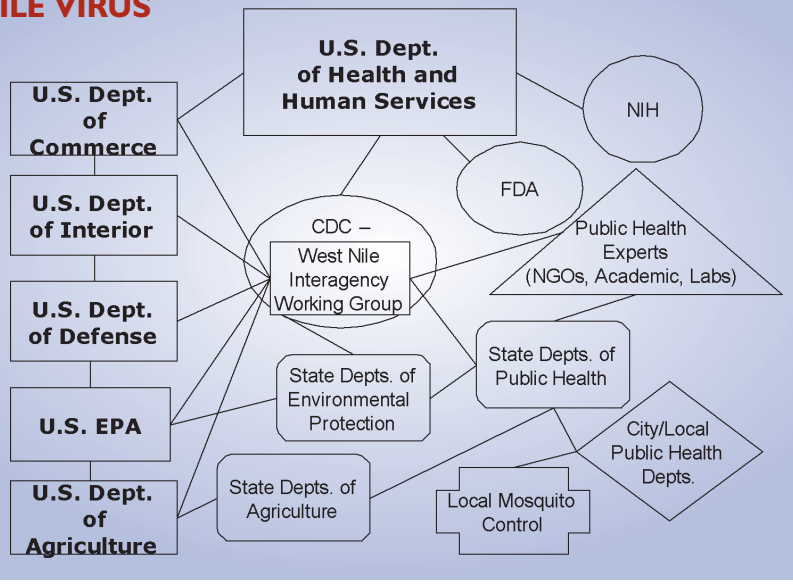
There is no specific therapy for treating WNV. In more severe cases, intensive supportive therapy may be necessary such as hospitalization, intravenous (IV) fluids, airway management, respiratory support (ventilator), and prevention of secondary infections (pneumonia). There is no vaccine to prevent WNV in humans, although a vaccine for horses is available.

The Public Health Response to West Nile Virus

Wild birds, especially crows, began dying in significant numbers in New York in June 1999. Several residents of New York City contracted encephalitis and soon after, horses on Long Island were showing signs of illness. Originally, the human cases were identified as St. Louis encephalitis (SLE), the most common mosquito-borne disease in the U.S. However, the two seemingly distinct animal and human cases were related. The cause was West Nile virus, a virus in the same family as SLE. The U.S. public health community was shocked at the discovery of WNV, previously found only in Africa, the Middle East and Europe. The outbreak ended in the fall of 1999, but not before 62 people developed severe encephalitis, including 59 requiring hospitalization, and seven who died.[32]

West Nile virus provides an example of how the lack of coordination and communication prevented information from being shared efficiently among public and animal health officials. Rapid and reliable communication within and between these communities is essential to preparedness and coordination. Sharing information quickly helps ensure decisions are made with the most current information. Yet public and animal health exist as two distinct fields, separated both in organization and culture. New York City public health officials were not aware of the similarities in the clinical symptoms occurring in the birds and

AGENCIES AND ORGANIZATIONS INVOLVED IN MANAGING WEST NILE VIRUS



humans until many days or weeks after the human outbreak began.[33]

The West Nile virus outbreak also highlighted the outdated communications systems that were in place. For example, while an electronic communication network was available at the time of the initial outbreak, not all involved agencies and officials were using it. CDC's laboratory was not linked to the New York State network. Consequently, the New York State Department of Health had to act as an intermediary in sharing CDC's laboratory test result with local health departments. Moreover, CDC and the New York State Department of Health laboratory databases were not linked to the database in New York City. Therefore laboratory results had to be manually entered in New York City.[34] Furthermore, these networks were not linked to laboratories at the U.S. Department of Agriculture's National Veterinary Services Laboratory in Ames, Iowa, which conducted tests of bird samples.

Since the outbreak began, communication and coordination has significantly improved. A West Nile Interagency Working Group was established and is housed at CDC. It combines the efforts of six federal Cabinet Departments, including CDC's parent agency, HHS. The Departments of Commerce, Interior, Defense, Agriculture, and the Environmental Protection Agency (EPA) are now collaborating to share information to understand the virus better, monitor WNV activity, and seek ways to prevent future outbreaks.[35] The National Institutes of Health (NIH), which is also part of HHS, is involved, too. All of these federal agencies then work in connection with state and local departments of public health, agriculture, environmental protection, and wildlife. Several states, such as Illinois, have also created cross-agency working groups to coordinate their intrastate agency efforts.[36] Mosquito control and monitoring the disease in animals are just two aspects of local West Nile management.

CDC's Working Group facilitates information sharing and coordination of activities among the range of agencies that have some connection to disease and wildlife surveillance and mosquito control. The Working Group schedules regular telephone conference calls among the federal agencies and CDC coordinates weekly conference calls with state public health agencies to coordinate national surveillance.

In addition, CDC began hosting an annual conference in 1999, bringing together state and local public health officials to share information on WNV. The conference proceedings form the basis for CDC guidelines on surveil-

THE IMPORTANCE OF LINKING DISEASE SURVEILLANCE SYSTEMS

There are many disease surveillance systems. Two examples are FoodNET, which the U.S. Department of Agriculture uses to track food-borne illness, and CDC's Behavioral Risk Factor Surveillance System, a phone survey which gathers data on behaviors that lead to chronic disease. More disease surveillance systems are being created regularly to address a particular disease. However, very few of these systems have the capacity to link their data with each other or with other health and environmental and databases.

This prevents public health officials and health care providers from obtaining a full picture of the health status of Americans. This also prevents the identification of behavioral and environmental factors that may contribute to disease. A Pew Environmental Health Commission report found that there is little "synchronization in the collection, analysis and dissemination of information."[40] In addition, much of the data that is collected is not frequently analyzed or interpreted in a way that might identify targets for further action.[41]

The goal for disease surveillance systems should be the ability to "talk" or interact with each other. Key linkages would be useful and important for informing disease monitoring, control, and prevention.

lance, protection, and control of WNV which are updated each year after the conference. The guidelines are developed with input from a variety of scientists and public health professionals, including virologists, epidemiologists, laboratory personnel, wildlife biologists, and state and local health and agriculture officials. CDC has also developed tests for use at state laboratories to diagnose WNV in humans, and provided training on how to use them.

One key feature of the West Nile prevention effort is CDC's "ArboNET," an electronic surveillance system to track and monitor WNV and other mosquito-borne illnesses. CDC launched the tracking system in 2000 for states to report test results from any animal including, bird, horse, mosquito, and human test results. ArboNET facilitates information sharing between CDC and numerous state and local public health agencies across the U.S.

Disease surveillance is a vital tool in helping public health officials understand how to control and prevent disease. ArboNET allows states to track crows, wildlife, and any animals impacted by WNV, in addition to humans. Wildlife provide a key indicator for tracking the spread of the disease and demonstrate the crucial and valuable need to connect human and animal health efforts.

ArboNET represents the first time that surveillance data from humans and animals have come together in a single system. Prior to 1999, this information may have been collected but was not reported at the same time and was not available until a year later. Most surveillance systems continue to operate in this manner. To help address this lack of coordinated surveillance, CDC is leading an ad hoc committee of federal, academic, and animal health groups to discuss a possible framework for developing an integrated national zoonotic disease tracking system. The committee met for the first time in August 2002.[37]

The isolated nature of ArboNET means that key linkages to other disease patterns and contributing health, behavioral, and environmental factors, which are all invaluable to effective disease prevention, are not being made. Currently, there is not a nationwide health tracking network that coordinates the monitoring of diseases and connects them to possible related factors. This type of information would help researchers gain a better understanding about which portions of the population are most at-risk as well as the causes and ways to control diseases.

As Lowell Weicker, Jr., former three-term U.S. Senator and Governor from Connecticut, stated, "at this point, we know more about the health status of dead crows than we do about humans. We should not have to rely on local weathermen's rain predictions to steer our national West Nile prevention and control strategy."[38]

MOSQUITO-BORNE ILLNESSES

Beginning in 1912, many states created agencies responsible for mosquito control, called mosquito abatement districts, to fight mosquito-borne viruses such as yellow fever and malaria.[42] These districts were quite successful at implementing Integrated Pest Management (IPM) to control mosquito populations and decrease the incidence of mosquito-borne disease. IPM involves reducing mosquito breeding sites, spraying pesticides on mosquito larvae, and spraying adult populations. Once mosquito-borne diseases were under control in North America, resources and funding for many state mosquito control programs were cut. New Jersey, for instance, traditionally had a substantial surveillance program to track mosquito-borne diseases using "sentinel" birds to detect the emergence of diseases. However, funding for this program dwindled, like many other programs in several states. With the introduction of WNV to the U.S. in 1999, states began to reinvest in mosquito surveillance programs.

Health tracking works. ArboNET has increased the understanding of how WNV spreads. Unfortunately, most disease surveillance systems suffer from the lack of national standards and uniform structures, resulting in a patchwork approach to surveillance. CDC has begun to address this problem with the National Electronic Disease Surveillance System (NEDSS), launched in October 1999.[39] NEDSS is an important step in the right direction, but, by itself, will not provide crucial linkages between surveillance systems that can help monitor, control, and prevent disease.

After a bumpy start, the public health response to WNV has evolved into a relatively coordinated campaign that integrates efforts between government agencies at the federal, state, and local levels. The piecemeal and reactive approach to disease management and prevention, however, has meant that the West Nile threat continues to grow and health officials fear that the disease is now endemic to the U.S.

Lyme Disease

Despite widespread understanding of the cause, history, and symptoms associated with infection, Lyme disease continues to sicken thousands of Americans each year-a number that is growing.[43] Thus, there is a strong need for continued pubic health vigilance on this disease.

Lyme disease was named in 1977 when numerous children in Lyme, Connecticut developed arthritis.[44] Further investigation revealed that the children had contracted the bacterium *Borrelia burgdorferi*[45] from the bite of infected black-legged ticks.[46] Since the original diagnosis, every state has reported cases of Lyme. The vast majority of infections have occurred in the northeastern and mid-Atlantic regions of the nation.[47] CDC reported 17,730 cases in 2000, the last year data were available. This number represents a notable increase from the yearly average of 12,745 Lyme cases reported from 1991-2000.[48] Officials estimate actual totals are consistently higher, due to underreporting caused in part by Lyme's asymptomatic tendencies.

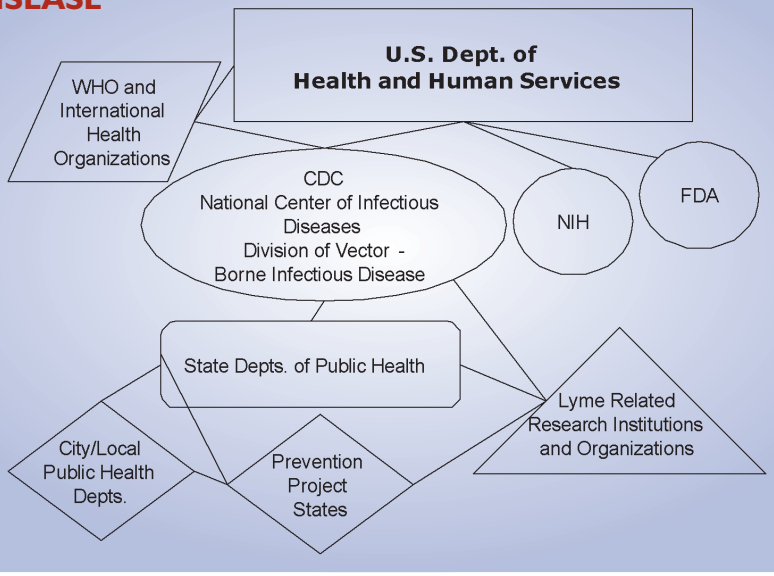
Lyme disease is transmitted when immature ticks feed on small rodents which are part of the transmission cycle of Lyme causing bacteria. In later stages of development, ticks transmit the bacteria to humans during the feeding process. This process usually occurs during the summer months, when ticks are most active and humans are most often outdoors.[49]

Within days to weeks of the transmission, 80 percent of Lyme patients report a red rash in the shape of a bull's-eye at the point of contact.[50] The rash is accompanied by tiredness, fever, headache, stiff neck, muscle aches, swollen lymph nodes, and general flu-like symptoms.[51] Some patients develop facial nerve palsy, similar to Bell's Palsy. If untreated, infected individuals may develop more severe versions of the early-stage symptoms, as well as motor and nerve inflammation, encephalitis, arthritis, and, rarely, cardiac problems, including enlargement of the heart and tissue surrounding the heart.[52] Early-stage patients are administered oral antibiotics for three to four weeks, while later-stage patients often require intravenous antibiotic treatment.

The Public Health Response to Lyme Disease

Since Lyme disease was first reported in 1977, the cases continue to rise. Reasons for the increase in reported cases of Lyme disease are likely the result of a true increase in incidence from factors such as increased human/tick

AGENCIES AND ORGANIZATIONS INVOLVED IN MANAGING LYME DISEASE



contact, and more complete reporting resulting from enhanced surveillance.[53]

The response to Lyme disease also shows how an early isolated and limited approach to managing the disease has not prevented a rise in the numbers of cases. Instead of being contained to the Northeast and Mid-Atlantic U.S., where it originally emerged, it has now been reported in every state. Even though the spread of infectious disease, not just human-to-human, but also animal-to-human, knows no boundaries, the public health response to disease containment as a state and then a regional problem meant that there was no strong national strategy for battling what has evolved into an expanding health threat.

Public health efforts toward Lyme disease have largely focused on prevention efforts and education. The key federal agency for Lyme related information is the Division of Vector-Borne Infectious Diseases (DVBID), part of the NCID at the CDC. This group collaborates with state

BIOTERROISM FUNDS AND ZOONOTIC DISEASE

In 2002, Congress passed the Public Health Security and Bioterrorism Preparedness and Response Act. The law authorizes the spending of $4.3 billion to improve public health preparedness, enhance controls on deadly biological agents, and protect the nation's food, medication, and drinking water supplies. Included in the legislation is a State Bioterrorism Preparedness and Response Block Grant Program. The funds are helping states develop plans for detecting and responding to biological attacks, create training programs, and upgrade hospitals' and other health providers' ability to serve victims of a biological attack. Funding is based on census population data, a sensible approach. However, this approach may not fully take into account the threats from animal-borne diseases. In Iowa, for example, there are only three million people, but there are 27 million pigs, which can be carriers of certain diseases including some strains of influenza. The block grants are unlikely to provide states like Iowa with enough funding to track the health of animal populations.[56] Both domestic and wildlife animals can serve as "sentinels" or early warnings for an emerging disease. Without sufficient funding to track animal health, the U.S. is missing the chance to detect a zoonotic disease early, and control, if not prevent its spread. This is troubling given that many bioterror agents are zoonotic.

and local public health departments, other federal agencies such as NIH, Lyme disease-centered foundations and non-governmental organizations, national and international health organizations, and academic institutions to promote research, awareness, and prevention.

Four of the most heavily impacted states, Connecticut, Massachusetts, New Jersey, and New York, have undertaken invigorated prevention projects.[54] In northeastern and mid-Atlantic states where the disease is endemic, the CDC hopes to lower Lyme rates to 9.7 cases per 100,000 persons by the year 2010.

Officials stress the importance of early diagnosis and treatment to prevent the onset of more serious, late-stage Lyme symptoms. A Lyme disease vaccine approved by the FDA in 1998 was removed from the commercial market in 2002, due to poor sales caused by concerns over the vaccine's possible connections to arthritis.[55]

While cooperation now exists between the federal, state, and local departments and officials in charge of controlling the disease, Lyme disease has become a permanent part of America's public health landscape. It provides a warning and example of how an apparent state or regionally-centered problem can grow to become a national problem. Instead of implementing a proactive nationwide animal-borne disease management strategy, the public health response to Lyme disease was left to evolve as the disease spread across the country.

Mad Cow Disease

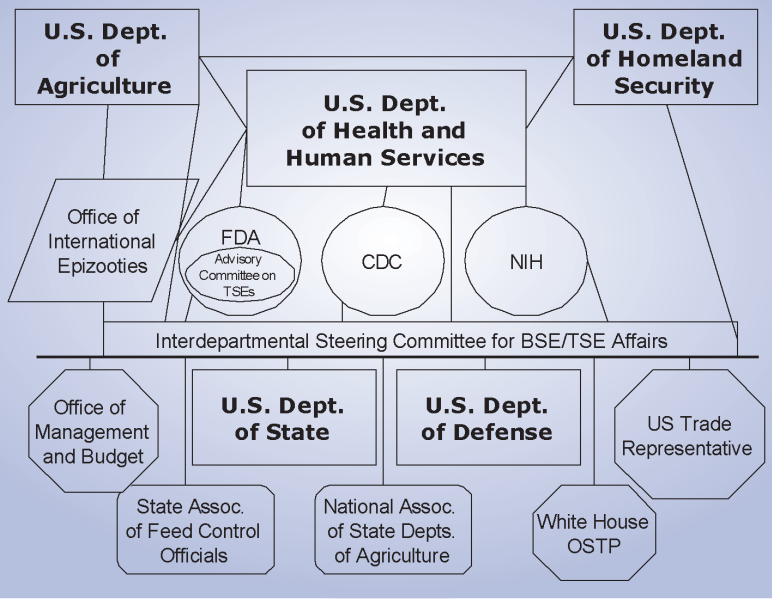
"Mad cow" disease is a fatal illness that strikes the central nervous system of cattle. Formally known as bovine spongiform encephalopathy (BSE), the disease was first diagnosed in Great Britain in 1986. It is now found in 33 countries, including Canada, where the disease was diagnosed in a native cow for the first time in May 2003.[57] Scientists are concerned because it appears that humans can contract a related illness, variant Creutzfeldt Jakob disease (vCJD), by eating infected beef. Over 130 cases of vCJD have been reported worldwide.[58] However, no cases of mad cow disease impacting cattle or humans have been reported in the U.S. to date.

Mad cow disease has an incubation period from two to eight years in cattle. The incubation period for vCJD in humans is unknown. However, it is likely that the incubation period ultimately will be measured in terms of many years or decades.[59] The relatively long incubation period of mad cow disease in cattle increases the difficulty of monitoring and preventing transmission to other cows.

When symptoms manifest, cattle experience progressive deterioration of the nervous system, often leading to erratic behavior, abnormal posture, weight loss, and eventually death. In humans, the symptoms of vCJD include problems with muscular coordination; impaired memory, judgment, and vision; and possibly depression or insomnia. As the disease progresses, the patient's mental capacity degenerates further and they eventually lose the ability to speak, enter into a coma, and die. There is no known treatment or vaccine to prevent the disease in animals or humans.

vCJD is one type of transmissible spongiform encephalopathy (TSE) that affects humans.

AGENCIES AND ORGANIZATIONS INVOLVED IN PREVENTING THE ENTRY OF MAD COW DISEASE INTO THE U.S.



Another TSE in humans is known simply as CJD, Creutzfeldt Jakob disease. CJD occurs spontaneously, striking approximately one in one million people and is not caused by eating infected beef. While the symptoms of both vCJD and CJD are similar, vCJD affects younger individuals, average age 29, and CJD strikes older individuals, average age 65.[60] There are other TSEs that affect different animals, including deer, elk, sheep, and mink. There is no known treatment or vaccine for these diseases.

The agent responsible for BSE is generally believed to be a malformed protein called a prion.[61] Prions cause normal proteins in the brain to become deformed, which leads to sponge-like holes in the brain, called "spongiform." These malformed proteins cannot be deactivated by pasteurization, sterilization, conventional heat, or chemical disinfection. A definitive diagnosis of BSE or vCJD can only be determined from post mortem testing of the brain.

The origin of mad cow disease is not known definitively, however, evidence suggests that certain contaminated feed ingredients are the source of the illness in cattle. For instance, cattle feed can become contaminated when the inedible remains from cows and sheep already harboring the mad cow disease agent are used to create a high-protein supplement which is then added to cattle feed. The BSE agent then can be transmitted to additional animals that are in turn slaughtered, and the process repeats. Many scientists believe this is how BSE was spread through cattle herds in the United Kingdom.

Public Health Response to Prevent the Entry of Mad Cow Disease into the U.S.

Mad cow disease demonstrates the complications that can arise because of the gaps between animal and human health communities, compounded by adding a possible food safety factor into the equation. Since mad cow disease is transmitted to humans through beef consumption, adding food regulation and monitoring agencies further complicates efforts to control and manage the disease.

While there has been no outbreak of mad cow disease in the U.S. to date, the discovery of BSE in a cow in Alberta, Canada, earlier this year raises increased concern that the disease could cross over into the U.S.

There are five federal Cabinet Departments, three offices within the Executive Office of the President, and three agencies within

HHS involved in mad cow disease prevention. Their efforts are connected through an Interdepartmental Steering Committee for BSE/TSE Affairs. At least a dozen federal agencies implementing more than 35 statutes make up the federal part of the food safety system, which is tasked with controlling food-borne illnesses.[62] Twenty-seven states are also involved in implementing food safety regulations. Each agency has unique responsibilities in carrying out the nearly three dozen federal laws.

The federal regulatory system for food safety evolved on a piecemeal basis, typically in response to a particular health threat or economic crisis. As lawmakers address new threats, they typically amend existing laws or enact new ones without updating previous statutes. The organizational and legal patchwork results in divided jurisdictions for specific food items among different agencies, which then have different authorities and responsibilities.[63]

Food safety problems occur in part because responsibilities are still divided among several agencies, and each of these agencies operates independently with different regulatory approaches.[64]

For instance, FDA regulates frozen pizza. However, if the pizza is topped with two percent or more of cooked meat or poultry, the USDA (Food and Safety Inspection Service) regulates it. Inspections at pizza production facilities follow two sets of guidelines, one issued from FDA and one from USDA.[65]

A range of legislators, consumer groups, the U.S. General Accounting Office (GAO), and the Institute of Medicine (IOM) at the National Academies of Science (NAS) have called for a change from the current Byzantine federal food safety system to a single, independent food safety agency.[66] Other countries, including Canada, Denmark, Great Britain, and Ireland, each have single agencies that are responsible for the full range of food safety activities.[67]

To help prevent mad cow disease from entering the U.S, the USDA implemented an import ban on live cattle and "ruminant" products, such as gelatin and some dietary supplements, from mad cow-impacted countries in 1989. In 1997, USDA implemented another ban - on live ruminant imports and most ruminant products from all of Europe. The same year, the FDA banned the practice of feeding remains from other animals to cattle.

To detect mad cow disease in U.S. cattle, the USDA implemented a surveillance program that conducts post mortem tests for BSE in the brains of cattle that cannot walk and those with central nervous system disorders. The Office of International Des Epizooties (the animal health equivalent to the World Health Organization) sets recommended cattle testing levels based on the size of the adult cattle population. Since 1994, the U.S. has complied with these levels. However, because testing is not performed on healthy animals, the percentage of total animals that are slaughtered each year is small. Only about 20,000 out of the 36 million cattle processed for food in the U.S. were tested for BSE in 2002.[68] Considerable resources are involved and testing a much higher percentage of cattle would be costly.

A study by the Harvard Center for Risk Analysis found that mad cow disease or a similar disease is unlikely to be introduced in this country.[69] This is largely a result of a relatively early, proactive response to prevent mad cow disease from entering U.S. shores by banning live cattle and feed from countries that have already been afflicted and by issuing cattle feed rules. The Interdepartmental Steering Committee for BSE/TSE Affairs demonstrates that once created, coordinated interagency, interstate groups dedicated to containing and preventing animal-borne diseases can be effective.

Chronic Wasting Disease

Chronic Wasting Disease (CWD) is a progressive, fatal disease affecting the central nervous system of elk and deer, including white-tailed, black-tailed and mule deer. CWD was first diagnosed in Colorado deer in 1967 and is now found in ten states and two Canadian provinces.[70] CWD is a one of several TSEs that attack the nervous system of various species. Other TSEs include mad cow disease in cattle and CJD and variant CJD (vCJD) in humans. As noted previously, TSEs are fatal and there is no known treatment or vaccine.

CWD primarily occurs in adult animals. Clinical signs are similar to other conditions such as malnutrition, but the most apparent and consistent symptom is steady weight loss. Other signs include listlessness, decreased interaction with other animals and repetitive walking in a set pattern, loss of muscle control, and eventual death.

While no known cases have been transmitted to humans to date, public health officials are concerned that eating deer or elk infected with CWD could lead to vCJD. A small number of individuals living primarily in the United Kingdom who ate beef infected with BSE developed vCJD. It is not known definitively whether eating CWD infected animals will cause vCJD in people. While there has been no causal link formally established between CWD and vCJD, states with affected deer and elk are conducting surveillance and testing to identify the disease.

Similar to mad cow disease, scientists generally believe that malformed proteins called prions cause CWD. The agent does not elicit any detectable immune or inflammatory response in the infected animals. Testing for CWD is mostly conducted through a post mortem examination of brain tissue. A test on live-animal tonsilar tissue has been developed. However, the test seems to only work for deer and not elk.[71]

Animals born both in captivity and in the wild have contracted the disease. Unlike mad cow disease, transmission of CWD has not been linked to any feeding practice in farmed elk or deer. The precise transmission mechanism of CWD is not fully understood, although evidence points to direct contact between infected and non-infected animals. Excreta from infected animals may be another route of transmission, especially in captive herds of deer and elk. Scientists have not yet understood the role of environmental contamination in wild populations.

Public Health Response to Prevent the Potential Threat CWD May Pose to Humans

In 2001, a working group was formed to address the disease, the national CWD Task Force. Co-chaired by the Department of the Interior and USDA, the Task Force includes state and federal officials, CWD experts from academia, and non-governmental institutions. The Chairman of the CWD Task Force's strategic plan committee estimates that if Congress fully funded the plan, the disease could be fully controlled in five years.[72]

The CWD public health response involves five federal Cabinet Departments and at least 12 federal agencies. The corresponding state and local health, wildlife, agriculture, and environmental protection agencies are also integrated into the prevention effort. Federal and state law gives states primacy and policymaking authority regarding wildlife management.

Nearly all states have adopted regulations that aim to stop the spread of CWD. State governments, with assistance from the federal government, are conducting research, surveillance, animal transport prohibitions, quarantine, destroying infected herds, farmer compensation for destroyed animals, and public education to manage CWD in wild and captive animals.

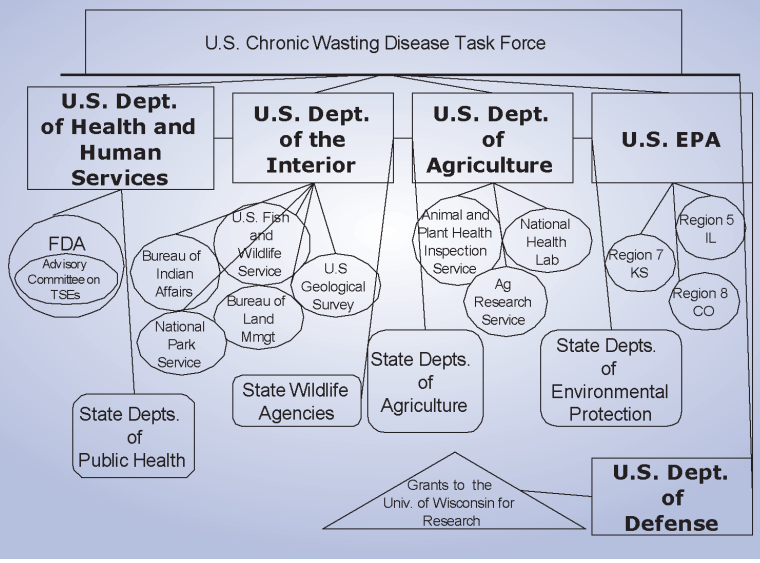
Some states have launched aggressive programs to reduce deer densities where CWD has been found. Nearly all states with CWD are randomly testing hunter-killed animals. USDA has a program to reimburse elk farmers up to $3,000 for animals that are destroyed.[73] Farmers who chose to participate in the program must agree to restock their land with animals other than deer or elk (cattle, swine, and sheep). Carcass disposal is also being performed at controlled landfills and incinerators to avoid possible contamination through water or air.

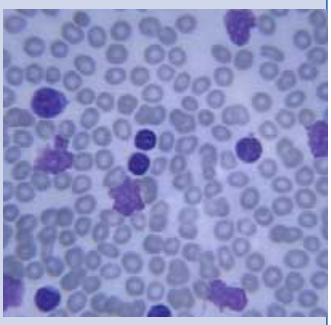
Although there is no scientific evidence that CWD can be spread to humans by contact with infected animals or through eating infected meat, it is unknown if such transmission can occur. States are therefore advising the public to take several precautions. For example, hunters are warned not to eat the brain, eyeballs, spinal cord, spleen, or lymph nodes of the deer they shoot, and they should not handle or eat any part of a deer that appears ill.

Public health and wildlife officials are concerned about CWD's ability to spread from states with the first diagnosed cases, Colorado and Wyoming, to states east of the Mississippi River, including Wisconsin and parts of Illinois. The concerns are often related to the economic impact of the disease. Nearly 11 million individuals spend over $10 billion on equipment and related costs to hunt big game such as deer and elk.[74] In addition, many state governments and private businesses rely on hunting and wildlife associated tourism for revenues. For example, Colorado's Division of Wildlife estimated that deer and elk hunters generated $599 million for the state's economy in 2001.[75] If uncontrolled, CWD has the potential to devastate deer and elk populations, resulting in major economic losses for state governments and private businesses that rely on revenues from hunting and wildlife associated tourism.

The CWD Task Force, which evolved in response to a health threat, has been successful in learning how to control, contain, and possibly in the future eliminate this animal-borne disease and avoid its spread to humans. The lessons from the task force are beginning to cross over into another area by working with the Interdepartmental Steering Committee for BSE/TSE Affairs, which focused on mad cow, a related disease. However, coordination between other types of animal-borne disease response efforts is virtually absent. The CWD Task Force and Interdepartmental Steering Committee for BSE/TSE Affairs, and the West Nile Interagency Working Group all evolved from the need to coordinate efforts across agencies and state lines. The knowledge gained from working to prevent individual diseases typically remains separate and distinct from other preventive efforts.

AGENCIES AND ORGANIZATIONS INVOLVED IN PREVENTING THE POTENTIAL THREAT CWD MAY POSE TO HUMANS





Conclusion and Recommendations

This country has faced a rash of the emerging infectious diseases in the past ten years, many involving animal-borne agents. Unfortunately, we have failed as a nation to strategically combat these serious health threats, leaving us vulnerable to new and emerging zoonoses. A crisis mentality in dealing with these diseases has evolved by default. We pour resources into the latest disease outbreak with few plans for addressing zoonoses from the broader perspective they require.

In reviewing these recent epidemics from a public health perspective, Trust for America's Health identified a number of systemic concerns. The issues range from balkanized government responsibilities, inadequate disease tracking and communication systems, minimal legal oversight or enforcement in preventing hazardous health conditions, and insufficient numbers of health professionals trained or dedicated to battling emerging infectious diseases. These gaps needlessly leave Americans, their families, and communities at risk.

To address the current problems in controlling and preventing animal-borne illnesses, TFAH offers the following recommendations to federal policymakers:

Congressional Hearings on the Need for Improved Leadership in the Fight Against Animal-Borne Diseases

TFAH research found over 200 different government offices and programs engaged in the response to just these five diseases, which creates a literal public health maze. As many as seven cabinet-level agencies are involved in efforts to research, track, and manage the diseases discussed in this report. Hundreds of state and local public health agencies, along with state departments of agriculture and environmental protection agencies, also play critical roles.

No one agency has clear leadership to oversee the nation's response to animal-borne diseases. This absence of leadership leaves federal, state, and local governments without the direction, resources, and effective strategies necessary to protect the American public from these threats. TFAH calls on the Senate Committee on Governmental Affairs and the House Committee on Government Reform to convene hearings on this issue. The hearings should examine how best to create a systematic approach to managing animal-borne diseases, including how to integrate and balance these requirements with the need to modernize and revitalize the overall public health infrastructure. In particular, the hearings should consider the lack of leadership in managing, preventing, and controlling these diseases. These committees should coordinate with other Congressional committees that have begun reviewing different facets of the zoonotic disease issue. For example, the Senate Committee on Environment and Public Works recently held a hearing on the importation of exotic species and the impact on human health and safety. It is now time to build on those efforts.

Leadership is needed ensure that the various governmental agencies — at the federal, state and local level — are coordinated, well-functioning, and capable of responding rapidly across jurisdictional boundaries. Just as the Department of Homeland Security coordinates different aspects of national security, there must be a concerted effort to ensure that we, as a nation, attack animal-borne diseases in a high-priority, unified, coherent, streamlined, and well-managed way.

Improving Preparedness to Respond to Animal-Borne Disease Threats Must Be Better Integrated into Overall Efforts to Modernize the Entire Public Health System

The public health system includes the network of local, state, and federal health agencies that collectively are responsible for disease prevention, response, and control. This system manages and responds to a wide-range of health threats, including infectious diseases, chronic diseases, and threats of potential chemical, radiological, and biological terrorism.

The overall public health infrastructure *"is still structurally weak in nearly every area,"* according to the CDC's 2001 report Public Health Infrastructure. The report calls for a system of "public health armaments," including a "skilled professional workforce, robust infrastructure and data systems and strong health departments and laboratories."[76] America's public health system was once a world leader in stamping out diseases like smallpox, influenza and yellow fever. Today, however, the system lacks the resources it needs to tackle current public health threats. Decades of under-investment have left our public health system with a shortage of qualified workers and outdated technology.

Moreover, animal-borne diseases present a new set of complexities to the nation's already limited public health system. These diseases call for different prevention and control strategies than infectious diseases spread only through human contact. For example, many different scientists with highly specialized knowledge must be involved, including wildlife biologists, ecologists, medical entomologists, epidemiologists, and virologists.[77] Animal and public health, however, exist as two distinct fields, separated both in organization and culture. Without better integration and coordination of these two fields, the special needs and responses to these diseases will continue to be managed only on a piecemeal and an emergency one-disease-at-a-time basis. For instance, it is entirely likely that new animal outbreaks will first be detected and analyzed in diagnostic veterinary laboratories.

Fixing the public health system requires recruiting qualified public health professionals, upgrading communications capacity, repairing public health laboratories, increasing the public health service's legal authority, and establishing a coordinated, comprehensive nationwide health tracking network.

Managing animal-borne diseases effectively, calls for, at a minimum, ensuring that public health professionals are well-trained and understand the public health threats and special nature of these diseases; increased training for medical students in zoonotic diseases; coordinating the activities of public health and diagnostic veterinary laboratories; reviewing laws impacting animal and wildlife control and commerce, with special attention to public health concerns; strengthening food protection statutes and regulation; and integrating the tracking of animal-borne diseases into a comprehensive disease surveillance system.

Create a Nationwide Disease Tracking Command Center at CDC

As TFAH's snapshot of five animal-borne diseases reveals, health officials utilize disease tracking systems that are seldom connected to other disease surveillance networks. Like the military's early warning systems, public health must have integrated, effective tracking systems to rapidly identify, control, and prevent health threats. Without such fundamental tools, health officials are virtually working in the dark, leaving them unable to quickly spot developing health crises and respond effectively. Tracking an emerging health threat, like a new animal-borne disease, allows health officials to identify its origin, understand how to diagnose and treat patients, and find ways to contain its spread. TFAH found that most animal-borne diseases are tracked on an ad hoc basis, or at a state level without formal interstate coordination. While CDC is leading an effort to plan an integrated zoonotic disease tracking system, funding for it will likely be a challenge. This could leave the implementation of the system uncertain.

CDC has established the independent ArboNET surveillance system that identifies cases of mosquito-borne illnesses, including West Nile virus. ArboNET, however, does not connect to other health tracking efforts, such as chronic diseases, that may be linked to similar vectors or environmental factors. These connections can be crucial to recognize and understand new diseases. For example, it was the identification of the sudden rise in arthritis in children in Lyme, Connecticut that led to the discovery and diagnosis of Lyme disease. Tracking West Nile virus in isolation, without the ability to track a range of diseases and make connections to possible contributing factors, severely limits the ability to gain necessary insights into causes and ways to better control and prevent disease. Being able to share and compare information across state and local boundaries is also essential to effective disease tracking, particularly in the case of animal-borne disease, since bugs know no boundaries.

The U.S. needs a tracking system that can address significant emergencies, like SARS and monkeypox, as well as looming threats that have the potential to strike at any time. Because of the current "disease du jour approach," CDC risks establishing hundreds of different databases that are not directly linked, integrated and may be redundant. It also limits the public health community's ability to understand the interconnections between diseases and possible causes.

Starting in 2002, Congress began an investment toward strengthening the nation's disease tracking capacity. As the U.S. Senate Appropriations Committee on Labor, Health and Human Services and Education recently stated, health tracking should be "compatible and integrated with other CDC and government tracking systems that focus on other environmental factors that may be related to health effects, such as infectious agents, behavioral risks, ultraviolet radiation, tobacco smoke, food-borne illness, naturally occurring substances, natural disasters, and temperature extremes."[78]

Congress has started in the right direction by appropriating $17.5 million in FY 2002 and $28 million in FY 2003 to initiate a Nationwide Health Tracking Network in several states and cities, overseen by the CDC. Yet, the cost of an integrated, comprehensive Nationwide Health Tracking Network is estimated at $275 million a year.

TFAH recommends Congress provide the mandate, resources, and support to establish a centralized disease tracking center within CDC for nationwide health tracking. This would include tracking animal-borne diseases, infectious diseases, chronic diseases, such as cancer and asthma, events related to bioterrorism, and environmental factors.

FEDERAL AGENCY	RESPONSIBILITIES BY DISEASE
Department of Agriculture U.S. agency involved in a myriad of food and health-related responsibilities, including food safety, anti-hunger, food and plant research, and conservation initiatives. Includes Food Safety Inspection Service, Animal and Plant Health Inspection Service, and the Animal Research Service.	**Chronic Wasting Disease** • Funds disease testing and monitoring efforts. • Runs reimbursement program for elk farmers. • Co-chair of CWD Working Group, in charge of studying disease and making recommendations for its management. • Conducts research and assists with disease management in states. **Lyme Disease** • Develops programs to reduce numbers of ticks on deer. **Mad Cow Disease** • Enforces regulations on animal importation into the U.S. including a ban on importation of live ruminants and most ruminant products like protein supplements from countries with BSE or at high risk of BSE. • Inspects all domestic cattle prior to slaughter; cattle showing signs of central nervous system disorders are not allowed to enter the human food supply. • Conducts research on BSE. **Monkeypox** • Assists state agriculture departments with tracing exotic pets involved in the outbreak. • Responsible for inspection, detention, and quarantine recommendations. **West Nile Virus** • Member of Interagency Working Group. • Tracks West Nile's impact on U.S. livestock and poultry. • Conducts research to develop methods for surveillance, monitoring, prevention and control.
Department of Commerce National Oceanic and Atmospheric Administration involved is the key operating division relevant to this report.	**West Nile Virus** • Conducts research with public health officials on the impact of climate patterns on mosquito populations, and helps develops plans for controlling mosquitoes. • Member of Interagency Working Group.
Department of Defense Mission is to provide military forces needed to deter war and protect the security of our country. The U.S. Army Medical Research Institute of Infectious Diseases, the Armed Service Blood Program Office, and the Global Emerging Infections Surveillance and Response System are among the relevant components for this report.	**Chronic Wasting Disease** • Conducting prion research for CWD. **Mad Cow Disease** • Member of Interdepartmental Steering Committee for BSE/TSE Affairs. **West Nile Virus** • Works on research and testing initiatives to prepare and treat the military and general public. • Tests the impact on the Armed Service Blood Program Office.
Environmental Protection Agency Works for a cleaner, healthier environment for America's air, water, land, and people	**Chronic Wasting Disease** • Researches and partners with local and state agencies to assess environmental impact of disease and resultant prevention efforts. **West Nile Virus** • Member of Interagency Working Group. • Researches and tracks the impact of pesticides used in prevention efforts.

FEDERAL AGENCY	RESPONSIBILITIES BY DISEASE
Department of Health and Human Services As part of its health mission, engages in research, service delivery, treatment, prevention, and public safety measures to ensure national health and well-being. Operating divisions include Centers for Disease Control and Prevention (CDC), Food and Drug Administration (FDA), and National Institutes of Health (NIH).	**Chronic Wasting Disease** • FDA works to minimize exposure to TSE in food products and blood supply. • FDA created TSE Advisory Committee. **Lyme Disease** • CDC oversees federal control and tracking efforts. • CDC helps to fund prevention projects in endemic states. • FDA tests effectiveness and safety of potential Lyme vaccines and drugs. • NIH conducts research and testing to learn more about the disease and encourage effective treatment and eradication. **Mad Cow Disease** • CDC conducts surveillance for any cases of vCJD among humans through analysis of death certificate data. • CDC undertakes research to improve understanding of TSEs. • FDA regulates animal feed - bans feeding mammalian protein to ruminants, including cattle, sheep and goats. • FDA conducts inspections in commercial feed mills to ensure compliance with the feed ban. • NIH conducts research on human TSEs (vCJD and CJD). **Monkeypox** • CDC coordinates emergency response, management, and investigation measures. • CDC develops recommendations for controlling infections and organizes enforcement efforts. • FDA enforces embargoes of imported African rodents and prairie dogs. • FDA manages potential impact on blood and plasma supply. **West Nile Virus** • CDC is in charge of initial investigation, tracking and diagnosis efforts. • CDC operates ArboNET, the electronic surveillance system for tracking mosquito-borne infectious diseases. • FDA protects against risk of contaminating nation's blood supply. • NIH engages in research and testing of the virus and seeks related treatments.
Department of Homeland Security Responsible for preventing terrorist attacks within the United States and minimizing the damage from potential attacks and natural disasters. Divisions relevant to this report include the directorates Border and Transportation Security and Emergency Preparedness and Response.	**Mad Cow Disease** • At ports of entry, reviews passenger declarations and cargo manifests to target high-risk. agricultural shipments that originate from BSE affected countries. **Monkeypox** • Enforces African rodent and prairie dog embargo via Bureau of Customs and Border Protection.
Department of the Interior Duties include research, stewardship of our land and resources, and conservation of national parks and protected regions. Relevant bureaus include the U.S. Fish and Wildlife Service, the Bureau of Land Management, National Park Service and the U.S. Geological Survey.	**Chronic Wasting Disease** • Responsible for research and management efforts in protected national land. **Monkeypox** • Enforces African rodent and prairie dog embargo via U.S. Fish and Wildlife Service. **West Nile Virus** • Assists states with diagnosis of wildlife infections. • Member of Interagency Working Group, responsible for, among other things, control and prevention measures on National Park land.

ANIMAL-BORNE EPIDEMICS OUT OF CONTROL: THREATENING THE NATION'S HEALTH

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