in both humans and birds. The virus isolated in Iowa was sent to the CDC in Colorado, where it was confirmed to be West Nile virus.

The discovery that the outbreak was West Nile fever had immediate responses from public health units. This was a disease that had never been reported in North America, and its spread would kill not only humans but horses. It also would infect dogs and cats, adding a new dimension of danger. The CDC requested new tissues from McNamara and from the NVSL in Iowa. They isolated West Nile virus.

Finally, the third week of September the puzzle pieces officially came together. On September 27, the CDC confirmed in a news release that a “West Nile-like” virus was responsible for the encephalitis outbreaks in New York City. In the end, thousands of birds had died and, in the sixty-two human cases of West Nile fever, there had been seven deaths. The CDC press release made no mention of the USDA’s National Veterinary Services Laboratory or the Army’s USAMRIID. An official government report compiled in Washington concluded that “better communication is needed” and that “links between public and animal health agencies are becoming more important.” 21 Again, more political speak: animal health and public health had been one health for a century.

The problem had been that too many governmental agencies did not understand the critical role of surveillance and the art of listening and communication it requires. The West Nile virus episode had been a master class in arrogance, ignorance, and scientific dysfunction of disease surveillance. But it was a minor event compared to what was coming. The same governmental failure to communicate and to meld all parties into a force for surveillance and rapid response was soon surpassed by a far greater debacle: the failure of federal agencies to communicate was greasing the skids for bioterror.

39. BIOTERROR, ANTHRAX, AND THE NATIONAL ANIMAL HEALTH NETWORKS

On September 11, 2001, television videos of the burning of the two towers of the World Trade Center in Lower Manhattan blocked television programs at 9 a.m. The north tower had been hit by American Airlines flight 11 and the south tower by United Airlines flight 175. By mid-afternoon the Pentagon had been attacked by American flight 77, and United flight 93 had crashed in a
Pennsylvania field. All had been bound for California, the long flight chosen by terrorists because the planes would be heavily fueled to inflict maximum damage. On the news that evening there was audio of the break-in of the terrorists on flight 93, with pilot Jason Dahl shouting, “What are you doing?” and then garbled messages and screams. The audio stream was never repeated—retracted and never again used. The massive response by the military and the federal, state, and local governments would take weeks to get us back to relatively normal life. A nationwide shutdown of all air traffic in the U.S. stranded friends in strange places.

The October 3 headline in the Des Moines Register was “NATO Ready to Fight With U.S.,” with subheads of “Group Cites ‘Clear Proof’ Against bin Laden” and “Wary Iowans Back Immigration Curbs.” The issue also contained the veterinary school dean’s article “Iowa Should Lead Fight Against Agroterrorism.” It pointed out our vulnerability to agroterrorism and what we needed to do in the way of prevention: “improve grass-roots diagnostic systems such as the centers at Iowa State—the Veterinary Diagnostic Laboratory and the Plant Disease Clinic—that would likely be the first to detect agents of agroterrorism.”

BEGINNING SEPTEMBER 18, 2001, one week after the World Trade Center attack, letters containing anthrax spores were mailed to several news media offices and two U.S. senators, killing five people and infecting seventeen others. The ensuing FBI investigation was one of the largest and most complex in the history of law enforcement.

The first set of letters had a Trenton, New Jersey, postmark dated September 18, 2001. Five letters, one each to the offices of ABC, NBC, and CBS, one to the New York Post, and one to the National Enquirer in Florida. Two more letters were mailed from the Trenton address three weeks later on October 8 to Senators Tom Daschle from South Dakota and Patrick Leahy from Vermont—the first was opened by an aide; the Leahy letter was mistakenly sent to an address in Virginia. Although the letters had been postmarked in Trenton, they had been mailed from a box at 10 Nassau Street near Princeton University.

The Florida letter was the first to kill; the journalist Robert Stevens died on October 5. Two postal employees at the Brentwood Station in Washington, D.C., were next, and then a Vietnamese immigrant in the Bronx and a ninety-four-year-old widow in Oxford, Connecticut, died. Autopsies were conclusive: all had died of inhalation anthrax.22
Material in the two sets of letters differed. The first contained a brown crumbly material that resembled Purina Dog Chow; the second, a dry powder consisting of pure spores. Both letters contained fictitious return addresses and misleading notes. The return addresses were to 4th Grade, Greendale School, Franklin Park, New Jersey 08852; there was no such school and no such zip code. The note in the first letter read: “O-O-11, THIS IS NEXT, TAKE PENACILIN NOW, DEATH TO AMERICA, DEATH TO ISREAL, ALLAH IS GREAT.” The manhunt began with full force.

The FBI soon announced that all of the powdery material found in the letters had been derived from a strain of *Bacillus anthracis* known as the Ames strain. Years previously, the Fort Detrick labs had received cultures from all over the Midwest and Southwest and had established one of the more virulent ones, which they labeled the Ames strain, as a standard. It had been mailed to more than sixteen laboratories in the U.S., as well as to sites in Canada, the United Kingdom, and Sweden.

Then, an irresponsible article in a Florida newspaper stated that the offending bacterium had been produced in “a laboratory in Ames, Iowa.” The reaction of the communications media was immediate and intense. At Iowa State, the veterinary school dean’s office was immediately swamped with television, radio, and newspaper people telephoning, e-mailing, and showing up at the college.

What did Iowa State know about the Ames strain? Where were anthrax cultures stored? Who had stolen it? In the next week the College of Veterinary Medicine did seven television interviews, one with *CBS Evening News*, as well as 107 press releases and over 30 radio interviews. Articles appeared in the *New York Times*, *Chicago Tribune*, *Los Angeles Times*, and the *New Yorker* magazine.

The next information released was that the Ames strain of anthrax had been sent from a veterinary laboratory in Iowa to the Army biodefense lab at Fort Detrick, Maryland, and then on to research facilities in the United States and Europe — and that somewhere along the trail, a terrorist had obtained the Ames strain and used it to attack humans. For a week, Iowa State University was in daily contact with the FBI, Iowa Department of Health, and Governor Vilsack’s office. The governor announced that the College of Veterinary Medicine would be constantly protected by the Iowa National Guard.

College authorities could not validate the information in the news. It was true that Professor Allen Packer had sent Iowa cultures of *Bacillus anthracis* to Fort Detrick during and after World War II. Professor James Roth had records
of the Department of Veterinary Hygiene and Public Health, but the characteristics, dates, and times did not match with those that had been sent by the FBI. Furthermore, records of the Iowa Veterinary Diagnostic Laboratory did not reveal a match with FBI information.

The Iowa National Guard established an around-the-clock guard over the veterinary school campus in Ames to guard against theft of anthrax bacilli. The costs of the military duty would be assessed to the veterinary school budget, an enormous sum that could not be paid. After appropriate phone calls, neither the FBI nor the CDC wanted the cultures, and both gave permission for Iowa State University to destroy the anthrax collection, which was done on October 10 and 11, 2001. It provoked some criticism, but the university no longer kept current strains, and those that had been archived had been sent by Professor Packer to Fort Detrick and were in the U.S. Army Medical Research Institute of Infectious Diseases—the USAMRIID—collection.

A month later, the history of the Ames strain was elucidated by the FBI. It had not originated in Iowa but in Texas and had taken a circuitous route to the dying patients. The Ames strain had come from a part of Texas where anthrax was endemic and ranchers and veterinarians were savvy on how to deal with it. In 1981 veterinarian Michael Vickers, who ran the Las Palmas Veterinary Hospital in Falfurrias, had done a necropsy on a seven-hundred-pound Beefmaster cow that had died within hours of becoming ill. He had done an autopsy in open pasture, twenty miles south of Hebbronville in Jim Hogg County. Suspecting anthrax, Vickers removed tissue from the heifer.

To confirm his diagnosis, Vickers had put samples of tissue into plastic bags and sent them by bus to the College Station diagnostic lab. The cow carcasses were immediately burned to prevent scavengers from spreading the disease. The College Station lab cultured the samples and within forty-eight hours found anthrax bacteria and called Vickers. The lab also answered a request it had received six months earlier from Army researchers at Fort Detrick for cultures of \textit{Bacillus anthracis}. The shipping room of the diagnostic lab reused a small box that had come to College Station from the National Animal Disease Center in Ames—without removing the return label.

When Fort Detrick received the package from Texas, the anthrax bacteria were sub-cultured, identified, and typed. It turned out to be a highly virulent strain and the culture was added to the Fort Detrick laboratory anthrax collection. It was recorded as the “Ames strain” because it had been shipped to Fort
Detrick in a used box still bearing the old return label from the U.S. Department of Agriculture lab in Ames, Iowa.

After what the public saw as far too long and after several false suspects had been cleared, FBI investigators focused on Bruce Ivins, a scientist at the Fort Detrick Army Biological Laboratory. But in July, Ivins had killed himself with an overdose of acetaminophen. With DNA evidence leading to a vial of anthrax spores in his lab, federal prosecutors declared Ivins to be the culprit and the case was closed.

A study of the investigation by the National Academy of Sciences, *Review of the Scientific Approaches Used During the FBI’s Investigation of the 2001 Anthrax Letters*, was released in 2011 that cast doubt on the government’s conclusion that Ivins was the perpetrator. Richard Spertzel, the veterinarian who led the U.N. biological weapons inspection of Iraq, wrote that the powder material used could not have come from Ivins’s lab since Fort Detrick did not make or use anthrax bacilli in powdered form and did not have the technology to weaponize anthrax with silica.

Early on it was believed that the powder material had been weaponized. That is, it had been prepared in pure spore form with silicates added (which injure the lung tissue in a way that promotes bacterial spore formation and enhances the disease). But elaborate tests with electron microscopy and metal assays did not reveal sufficient amounts or quality of silicates in the powders saved from the letters. Investigators also found no evidence of bentonite in the powder—bentonite was the signature component of Iraq’s anthrax weapons. White House spokesman Scott Stanzel, a native of Sac City, Iowa, disputed reports that the anthrax powder sent to the Senate had contained bentonite (silica and aluminum are the major ingredients of bentonite).

Biological weapons have serious limits. The most likely antihuman biological agents, anthrax and smallpox, are difficult to produce and so dangerous that they pose serious hazards for those who would use them. Most technical means for delivery are ineffective—biological agents degrade on storage, and military missiles and high-flying aircraft for aerosolizing pathogens are not sufficiently accurate or effective. Perhaps the biggest problem for bioterrorists is that time is required for disease to develop and spread in animal and human populations, time that allows for diagnosis and intervention with vaccines and antibiotics. None of this matters in the face of a determined enemy, though, especially one who is dedicated to the destruction of Western civilization.
Throughout North America, the anthrax attacks highlighted a need for modern veterinary research and diagnostic facilities to protect livestock. Current ventilation and plumbing systems could not deal with anthrax, brucellosis, and other dangerous zoonotic agents. Modern biosecure diagnostic laboratories and housing for new information technology that could connect with national networks were required for rapid responses. One by one, the major veterinary research institutes and diagnostic laboratories scrambled to build new facilities that would include secure laboratories that could handle dangerous pathogenic agents. Cornell University completed an impressive new facility in 2001, with space for two hundred professional scientists and an amended mandate from the State of New York to add diseases of zoo and wild animals and other environmental pathogens to its diagnostic protocols. The Texas Veterinary Medical Laboratory, which had opened in College Station in 1967, was expanded to meet the new threats to the state’s livestock industry.

New technology and biosafety rules made new microbiological research laboratories expensive and risky. Few universities were willing to spend the money to modernize: the University of Georgia, pushed by microbiologist John Bowen and Dean David Anderson, developed a concept and gained $100 million in state funds to build a BL3 safety level laboratory on the Athens campus; plagued by construction errors, the building did not pass BL3 biosafety tests, leaving it in limbo until an astonishing rescue in the next decades. Tests required for federal approval of BL3 status created extraordinarily high pressures and vacuums in the building—so high the air would be sucked through miniscule pores in concrete—making it difficult for inexperienced architects and construction workers to achieve the necessary goals.

The University of Georgia Animal Health Research Center was dedicated in July 1996, but there had been catastrophic problems in construction and threats from university business managers to tear down the building. Dean Keith Prasse and succeeding dean Sheila Allen kept going with Bulldog persistence until problems were overcome and the BL3 unit was approved. Prasse and Allen hired experts in infectious diseases and vaccine technology. It took over a decade, but the first BL3 labs were commissioned in 2005. Today, as investigations on influenza, rabies, and tuberculosis have been highly productive, funding for the Animal Health Research Center has increased fourfold—an achievement rarely matched by such vision, perseverance, and dedication to high science. It
was a long and expensive learning process, but in the end it worked and would make the University of Georgia a focus for global zoonotic plagues.

A major nationwide stimulus for expansion of diagnostic centers was the increased funding offered by the USDA’s Animal and Plant Health Inspection Service. Its response to bioterror was to create the National Animal Health Laboratory Network, a partnership with national and state laboratories to facilitate the early detection of and response to (and recovery from) emergency animal diseases. The network has fourteen level 1 laboratories and over sixty lower-level partners that are federal, state, and university labs. The major concerns in peacetime are foot-and-mouth disease, classical swine fever (hog cholera), avian influenza, Newcastle disease of birds, chronic wasting disease (zombie disease) of deer and elk, and scrapie. But in a bioterror attack, the capacity to focus on the issue at hand is required for rapid emergency response.

Effective barriers appeared to be in place. Governmental oversights at federal, state, and local levels were operating, but the rules of the game keep changing. A massive, uncontrolled outbreak of a foreign zoonotic disease in livestock would soon be economically devastating. There is no zero risk when global commerce is coupled with a worldwide network of informed terrorists armed with modern information technology and dedicated to murder and economic destruction of the U.S. Higher security requires greater technological commitment. Scientists have to ask the right questions, identify the most critical problems, provide adequate solutions, and keep the public informed. Iowa learned much about the costs of mass depopulation programs in the avian influenza outbreak in 2015; it was an expensive struggle to dispose of millions of dead young chickens, laying hens, and turkeys by burying, incinerating, or composting infected carcasses in improvised landfills and composting sites.

As a response to potential agroterrorism threats after the World Trade Center bombing, James Roth at Iowa State University developed the Center for Food Security and Public Health to focus on information and training. Funded largely by the USDA to train staff employees, it filled an important niche in public health planning. About the same time, he started the Institute for International Cooperation in Animal Biologics (IICAB) to deal again with training and cooperative ventures in commercial production of vaccines and biological drugs. The Center for Food Security and Public Health at Iowa State was dedicated to keeping the public alert and informed as a critical part of food
safety. The world traveler who surreptitiously bypasses immigration inspections, the bus tour guide who advises his group when reentering the U.S. on ways to hide meat and vegetables from agriculture border inspectors, the cattle buyer who moves cattle from state to state to avoid inspection—all of these raise our risk from zero.

Today, a major threat is African swine fever, a great plague closely resembling hog cholera—classical swine fever—in its rapid onset, hemorrhages, and rapid lethality. In the first year, lost exports could cut pork receipts by nearly half—closing one-quarter of Iowa producers and costing the U.S. pork producers $8 billion. A million pigs are moved daily in the country, and during the ten-day incubation period of African swine fever, pigs would be transported to new sites. Perpetuation of the disease would drive costs to many times that; if the disease gets into wild pigs, it might last forever. Mass depopulation of pigs entails enormous expense. Euthanized animals must be composted on site since infected carcasses cannot be transported on roads that pass other producers and landfills cannot accept infected materials.

The national economy took a hit at the end of 2001. The Enron scandal broke and was one of the best-known examples of corporate fraud and corruption. The Enron Corporation was an American energy company that provided electricity and natural gas services and had been named by Fortune magazine as America’s Most Innovative Company for six consecutive years. But its financial condition had been sustained by an institutionalized, systematic, and creatively planned accounting fraud. Before it was over, investors had lost over $15 billion. The national effect rippled through the economy right down to veterinary practices and to the budgets of veterinary institutions. The economic downturn drove state legislatures to look closely at unique solutions to economic lethargy—venture capital, startup incubators, and tax reductions as incentives for small businesses. Modern, biosecure research labs are required for the public’s safety against the threat of foreign animal disease. Reports of animal plagues, even though false, have a destructive impact on the stock market. From the Des Moines Register, March 14, 2002: “Corn futures fell sharply Wednesday on the Chicago Board of Trade amid rumors—denied by the U.S. Department of Agriculture—of foot-and-mouth disease in some Kansas cattle.”

Then another recession—which started in December 2007 and lasted until June 2009—slammed support for education before it had recovered from the
previous recession. The federal government increased tax credits for education and poured millions of dollars into college enrollment subsidies, including Pell Grants to subsidize college for low income families. But with tax revenues plunging, states cut funding for higher education, and colleges responded by raising tuition and spending less on educating students. Veterinary student debt was rising to ominous heights—potential starting salaries were incompatible with gigantic student loans. The opportunity costs of college education were out of whack and were shifting the economic origins of those enrolling in veterinary schools.

For fifty years, the nation’s premier laboratory to study dangerous animal microbes that were foreign to the United States was the Plum Island Animal Disease Center. Now the buildings and their elaborate ventilation and airflow systems were out of date. Worse, the center had no capacity to safely handle biosafety level 4 microorganisms such as anthrax and Ebola virus. Rethinking the plans to renovate Plum Island, planners decided on an entirely new facility in a more accessible location.

The plans were that the new facility be named the National Bio and Agro-Defense Facility—NBAF for short—and that operations would be under the new Department of Homeland Security. A group of twenty-nine sites considered for the new laboratory was whittled to six in 2008: the University of Georgia in Athens; the Texas Research Park in San Antonio; the Umstead Research Farm in Granville County, North Carolina; the Flora Industrial Park in Madison County, Mississippi; the Kansas State University campus in Manhattan, Kansas; and the Plum Island Center site in New York. The final decision, published in the Federal Register on January 16, 2009, was Manhattan, Kansas. The State of Kansas had donated land for the new facility, recruited a veterinary expert in African swine fever, Juergen Richt, and provided funds for Kansas State University to build and staff its Center for Excellence for Emerging and Zoonotic Animal Diseases, a name so complex that even its acronym, CEEZAD, is unwieldy.

Construction was delayed by concerns of the continental location. Groups in Kansas and elsewhere had organized to defeat the Kansas State University site, publicizing the dangers of bringing animal disease agents into the heart of the livestock-producing Midwest. The laboratory was to study foot-and-mouth disease, contagious bovine pleuropneumonia, and hog cholera (now named
classical swine fever), and the worry was that the location could release these agents into agricultural areas. The Department of Homeland Security paused to do a study and used the National Academy of Sciences to investigate the site location. Completed in June 2012, the National Academy of Sciences report supported Kansas. A ground-breaking ceremony was held on May 27, 2015, with Kansas senator Pat Roberts, Governor Sam Brownback, Agriculture Secretary Tom Vilsack, and Homeland Security’s Jeh Johnson. Construction was to begin on campus with the date for transfer of Plum Island operations to Kansas set for 2023. Control of the new laboratory was transferred from the Department of Homeland Security to the Agricultural Research Service in 2019.

40. ANTI-SCIENCE SCAMS AND KEYS TO PROGRESS

Since 2000, commercial, academic, and religious anti-science scams have accompanied the rise in the public’s distrust of science. Expansive commercial ventures in animal and human health developed that provided scams for the unwary financier. After retirement from the Veterinary Medical Research Institute, Professor William Switzer, known internationally for research in respiratory diseases of pigs, entered into an arrangement with an entrepreneur to create Mitogenetics LLC, which billed itself as a research and development company focused on biomedical technology “to preserve a healthy lifestyle.” Switzer was listed as the company’s founder, company director, and chief science officer, but offices were in Sioux Falls, South Dakota, with a businesswoman listed as CEO and president.

According to its website, “Mitogenetics has found therapeutic solutions for mitochondrial and cellular changes used in diseases like type 2 diabetes, obesity, heart disease, hypertension, Alzheimer’s disease, and Parkinson’s disease—to name a few that have been linked to mitochondrial dysfunction.” But it was not true. There were no solutions, nor was there evidence that there might be—there were no laboratories, no research, and no science. A few other scientists located elsewhere were listed, but there were no authentic original scientific publications or any other evidence of innovative science done by Mitogenetics. When the investors’ money was gone, Mitogenetics came back for more—but it was too late.