THE HUMANE SOCIETY OF THE UNITED STATES

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An HSUS Report: Human Health Implications of Long-Distance Live Farm Animal Transport

Abstract

Modern animal transport systems are ideally suited for spreading disease, as the animals commonly originate from different herds or flocks and are confined together for long periods in poorly ventilated, stressful environments. These factors tend to favor the emergence and transmission of diseases capable of affecting both human and animal health on a grand scale. Long-distance live animal transport may also increase vulnerability to bioterrorist attack. Whether intentional or natural, epidemic outbreaks of animal disease may have serious public health implications which can be mediated by tighter regulations on live animal transport and a transition towards carcass-only trade.

Introduction

In the United States alone, more than 50 million live cattle, sheep, and pigs(1) and an untold number of the more than 9 billion chickens, turkeys, and other birds raised for food(2) are traded across state lines in a single year. Before they are slaughtered, livestock travel an average of 1,000 miles,(3) but some journeys are much longer.(4) Long-distance transport not only increases the opportunities for animals to come into contact with—and to spread—diseases, but also increases their susceptibility to infection.(5)

Implications for Livestock

According to the Food and Agriculture Organization of the United Nations (FAO), "Transport of livestock is undoubtedly the most stressful and injurious stage in the chain of operations between farm and slaughterhouse" which leads to significant "loss of production."(6) This stress impairs immune function, increasing the animals' susceptibility to any diseases they might experience on their prolonged, often overcrowded journeys.(7) Some pathogens, for example, that would not lead to disease under normal conditions, become activated during transport due to the stress-induced immunosuppression, triggering a wide variety of diarrheal and respiratory diseases. So-called "shipping fever," the bovine version of which costs U.S. producers more than $500 million a year, is often caused by latent pathogens—including a SARS-like virus(8)—which may become active when "shipping cattle long distances."(9)

For the control and prevention of shipping fever, the *Merck Veterinary Manual* advises, "Transport time should be minimized, and rest periods, with access to food and water, should be provided during prolonged transport."(10) Likewise, in a 2002 report, the European Commission's Scientific Committee on Animal Health and Animal Welfare noted that "[w]ith increasing duration of journey, the welfare of animals generally gets worse because they become more fatigued, incur a steadily increasing energy deficit, become more susceptible to existing infections, and may become diseased because they encounter new pathogens" and concluded that "[j]ourneys should be as short as possible."(11)

Given the stresses and heightened susceptibility to disease during shipping, coupled with often lengthy transport routes, it follows that the FAO blames "[t]ransport of animals over long distances as one cause of the growing threat of livestock epidemics….”(12) Dozens of outbreaks of foot and mouth disease, for example, have been tied to livestock movements(13) or contaminated transport vehicles.(14) Other important diseases which may be transmitted by transport include classical swine fever,(15) exotic Newcastle disease of birds, bovine viral diarrhea, African swine fever, swine dysentery, swine vesicular disease, porcine reproductive and respiratory syndrome, post-weaning multisystem weaning syndrome, porcine dermatitis and nephropathy syndrome, enzootic pneumonia, bovine rhinotracheitis, glanders, and sheep scabies.(16)

Implications for Wildlife

This movement of animals raised for food can also threaten wildlife. The greatest animal plague ever recorded in history was the “Great Rinderpest Pandemic” at the end of the 20th century. The Italian army used cattle to pull gun carriages into sub-Saharan Africa, a practice that triggered the spread of a measles-like disease of cloven-hoofed animals called rinderpest which wiped out not only up to 95 percent of cattle in some countries,(17) but up to 90 percent of other large ungulate species, such as the African buffalo and giraffe.(18) Societies based on the cattle economy were devastated as well. As one Masai man described, the corpses of both cattle and humans were “so many and so close together that the vultures had forgotten how to fly.”(19) No longer can natural barriers like the Saharan desert protect populations against the spread of such devastating epidemics.

A contemporary example of the toll long-distance live animal movement exacts on wildlife is an emerging fungal disease discovered in 1998 and causing massive die-offs and even extinctions of amphibious wildlife across five continents.(20) Ecologists now suspect the international restaurant trade of the North American bullfrog for their fleshy legs may have played the key role in the global dissemination of this disease.(21)

Implications for Human Foodborne Disease

Long-distance live animal transport can also increase the risk of human food poisoning.(22) In one study at Texas Tech University, for example, the average prevalence of *Salmonella* within feces and on the hides of cattle was 18 percent and 6 percent, respectively, before transport. After the animals were loaded onto a vehicle and trucked for 30 to 40 minutes, the levels of *Salmonella* found in feces increased from 18 percent to 46 percent, and the number of animals covered with *Salmonella* jumped from 6 percent to 89 percent upon arrival at the slaughter plant, where fecal contamination on the hide or within the intestines can end up in the meat.(23) Similar results were found in pigs.(24)

Salmonella hospitalizes thousands of people every year and kills hundreds.(25) Data published by the Centers for Disease Control in June 2005 added to the evidence that antibiotic-resistant *Salmonella* was a growing public health threat.(26) A five-fold increase in resistant strains was noted between 1998 and 2001.(27) One strain, known as *Salmonella Newport* MDR-AmpC, is growing resistant to even ceftriaxone, an antibiotic vital for combating serious infections in children.(28) The physiological stress of transport increases a healthy animal’s susceptibility to disease while, at the same time, enhancing a sick animal’s ability to spread contagion.(29,30)

Because long-distance transport commonly causes crippling injuries that leave animals unable to stand, the practice annually produces hundreds of thousands of “downed” animals who are often inhumanely dragged or pushed to slaughter at journey’s end. Providing rest, food, and drink to animals in transport will reduce the incidence of fatigue, stress, and crippling injuries, which in turn will reduce the number of non-ambulatory or downed animals arriving at slaughtering facilities. Downed animals are more likely to be infected with diseases, including *E. coli* and *Salmonella*, because “lame cattle usually have higher levels of bacteria on their carcasses” as these animals “spend more time lying down, which increases the likelihood they will be contaminated with fecal matter.”(31)

A 2005 review in the *Journal of Dairy Science* concentrated on the risk of contracting toxin-producing *E. coli* associated with eating dairy cow ground beef tainted with feces. These toxin-producing strains, like the *E. coli*

0157:H7, can cause hemorrhagic colitis (profuse bloody diarrhea) and then progress to kidney failure, seizures, coma, and death, particularly in young children. Meat from diseased and disabled cattle has also been implicated in a similar life-threatening disease in dogs.(32) Dairy cows "enter the food chain as ground beef," the review concludes. "As a result, downer dairy cows harboring STEC [Shiga-Toxin producing *E. coli*] at slaughter can be a health risk to humans."(33)

In a recently published study, the U.S. Department of Agriculture investigated the "potential impact on human health that may occur following consumption of meat derived from downer dairy cattle" by measuring the infection rates in downers of *E. coli* 0157:H7. These researchers found that downed cows were more than three times as likely to harbor the potentially deadly *E. coli* strain than walking cull dairy cows. Moreover, some of the *E. coli* taken from the downed animals were found to be resistant to multiple antibiotics.(34) They conclude that "downer dairy cattle harboring *E. coli* 0157:H7 at slaughter may be an important source of contamination and may contribute to the health risk associated with ground beef."(35)

Dr. Carolyn Stull of the University of California at Davis has tied *Salmonella* infection directly to downer cows. Reporting her results at a 2004 American Meat Institute conference, Dr. Stull's team sampled 50 downer cows and found 7 to be infected with *Salmonella*. Despite their contamination, at least 5 of the 7 infected cows were known to have passed inspection for human consumption.(36) Consumers face risks, such as *E. coli* and *Salmonella*, from ingesting downed animals who become contaminated by fecal matter after collapsing from the rigors of long-distance transport and then linger in fecal matter and urine as it accumulates throughout trips that can span days.

Implications for Human Epidemic Disease

As serious as foodborne illness is, long-distance live animal transport may increase the risk of potential human respiratory pathogens capable of triggering epidemics of disease. In 1998, for example, on an industrial pig farm in Malaysia, pigs developed an explosive cough which became known as the "one-mile cough," because the violent hacking could be heard from such a distance. The disease was called "barking pig syndrome," after the unusually loud "barking" cough.(37) Soon, many pigs started coughing blood.(38) They developed neurological symptoms. The sows started pressing their heads against the walls, became agitated, started twitching, became paralyzed, and started to seize into spasms. Many died within 24 hours.

Using pigs as their conduit, the virus then turned its attention to others. Every animal in the vicinity started falling ill—other farm animals, such as goats and sheep; companion animals, such as dogs, cats, and horses; and even wild animals, such as surrounding deer—and succumbed to severe, fatal, respiratory distress. Humans were no exception. People broke out in high fevers and headaches as their brains began to swell. Then many started to convulse. Those who went into coma never woke up.(39) On autopsy, their brains and lungs were inflamed and swollen with fluid.(40) The virus was called the "Nipah" virus, named after the village with the first human fatality.

The disease erupted in the northern part of the Malaysian peninsula, but ultimately swept nationwide on a seven-month rampage, thanks to long-distance live animal transport.(41) "A hundred years ago, the Nipah virus would have simply emerged and died out," the Thai Minister of Public Health explained, "instead it was transmitted to pigs and amplified. With modern agriculture, the pigs are transported long distances to slaughter. And the virus goes with them."(42)

The Nipah virus took the lives of approximately 100 people. Avian influenza—so-called "bird flu"—has the potential to trigger a pandemic of human disease predicted to kill millions.(43) Nearing the end of 2003, the FAO, along with other international entities, began to hear rumors of widespread outbreaks of a virulent disease obliterating chicken flocks across Southeast Asia.(44) Reports were coming from so many directions at the same time that authorities didn't know which to believe. Within a month, though, they were all confirmed. H5N1 had burst forth from China, erupting across eight countries nearly simultaneously. The H5N1 avian influenza is quickly becoming the greatest outbreak of bird flu in history. Within a few months, more than 100 million birds across Asia were killed by the disease or culled.(45)

Given the pattern and timing of outbreaks, the FAO identified the transport of live birds reared for human consumption as a primary culprit in the "rapid spread" of avian influenza throughout Asia.(46) In February 2004, the FAO reported that 5,000 chickens succumbed to avian influenza in Lhasa, Tibet, and that these infected birds were transported to Tibet from China's Lanzhou city—a trip spanning more than 1,000 miles.(47) The farther the animals are transported, the farther the diseases may spread.(48)

Long-distance live animal transport has also been blamed for the spread of potentially dangerous swine flu viruses in the United States. During the devastating 1918 human influenza pandemic, millions of pigs also fell ill. The question at the time was: Did they give it to us, or did we give it to them?(49) Our current understanding of the chain of events was that the H1N1 virus, which triggered the pandemic, started, as it always does, in waterfowl, which spread to domesticated poultry, which then spread to humans, before finally dead-ended in pigs.(50) For 80 years , the H1N1 virus circulated in pig populations, becoming one of the most common causes of respiratory disease on North American pig farms,(51) until 1998.

Throughout the century, influenza viruses had established a stable H1N1 lineage within U.S. pigs. That changed in August 1998 when a barking cough resounded through a North Carolina pig farm where every one of thousands of breeding sows fell ill. An aggressive H3N2 virus was recovered, the type of influenza that has been circulating in the human population since 1968. Not only was this highly unusual—only a single strain of human virus had ever been isolated from an American pig population—but, upon sequencing of the viral genome, researchers found that it was not just a double reassortment (a hybrid of human and pig virus, for example), but a never-before-described(52) triple assortment, a hybrid of three viruses—a human virus, a pig virus, and a bird virus. "Within the swine population, we now have a mammalian-adapted virus that is extremely promiscuous," explained one molecular virologist, referring to the virus's proclivity to continue to snatch up genes from human flu viruses. "We could end up with a dangerous virus."(53)

Within months, the virus appeared in Texas, Minnesota, and Iowa.(54) Within one year, it had spread across the United States.(55) The rapid dissemination across the nation was blamed on the cross-country transport of live pigs.(56) In the United States, pigs travel coast to coast, frequently born in North Carolina, fattened in the corn belt of Iowa, and then slaughtered in California.(57) While this regional segmentation of production stages may cut down on short-term costs for the pork industry, the highly contagious nature of diseases like influenza—made perhaps further infectious by the stresses of transport(58)—needs to be considered when calculating the true cost of long-distance live animal transport.

Implications for Bioterrorism

Long-distance live animal transport not only places countries at risk for catastrophic disease outbreaks,(59) but, according to the federal General Accounting Office, makes countries vulnerable to bioterrorism as well.(60) U.S. animal agriculture has been described as a particularly easy target,(61) as "one of the probable threats for an economic attack on this country,"(62) according to the U.S. Deputy Secretary of Agriculture, as well as a direct attack on our citizenry.

In 2004, the RAND Corporation prepared a report on agroterrorism for the Office of the Secretary of Defense entitled "Hitting America's Soft Underbelly," in which U.S. vulnerability was blamed in part on "[t]he concentrated and intensive nature of contemporary U.S. farming practices."(63) According to the last U.S. Department of Agriculture census in 1997, just 2 percent of the nation's feedlots produced three-quarters of the cattle and 1 percent of U.S. egg farms confined more than three-fourths of the nation's egg-laying hens.(64) Given that "highly crowded" animals are reared in "extreme proximity" in the United States, one infected animal could quickly expose thousands of others.(65)

In its report, the RAND corporation points out individual animals themselves have become progressively more prone to disease in the United States as a result of increasingly routine invasive procedures: “Herds that have been subjected to such modifications—which have included everything from sterilization programs to dehorning, branding, and hormone injections—have typically suffered higher stress levels that have lowered the animals’ natural tolerance to disease from contagious organisms and increased the viral and bacterial ‘volumes’ that they normally shed in the event of an infection.” Long-distance live animal transport could then ferry the spreading infection, according to USDA models, to as many as 25 states within just five days.(66)

The dangerous introduction of animal diseases is not new. Veterinary historians document at least a dozen attacks over the last century, starting with the first national biological warfare program(67) in World War I in which German agents on three continents introduced anthrax and other livestock diseases. New York, Maryland, and Virginia were among the targets hit.(68) During World War II, the Allies stockpiled 5 million anthrax cakes that were to be spread over German pastures by parachute. The program was called “Operation Vegetarian.”(69) After World War II ended, the United States developed a number of biowarfare weapons, including cluster bombs filled with hog cholera or poultry virus-laden feathers that could be exploded at 1,500 feet.(70) In the 1970s, a major human outbreak of anthrax in Rhodesia, infecting more than 100,000 people, undermined the struggle there for independence, an outbreak now considered to have been “very likely intentional.”(71)

Biological warfare agents can be transmitted by unwitting co-conspirators—farm animals alive in trucks or dead and wrapped in plastic, or via their products. In 1994, the single largest point-source outbreak of *Salmonella* occurred, affecting more than 200,000 ice cream aficionados—mostly children—after a tanker of milk was hauled in a truck that had previously carried contaminated liquid eggs.(72) This sparked research into the safety of the annual 20-billion gallon U.S. milk supply.(73)

Stanford University researchers concluded that just a fraction of a single ounce of botulinum toxin placed into bulk milk holding tanks or transport trucks, which feed into the industry’s 50,000-gallon milk silos, could poison hundreds of thousands of Americans.(74) Symptoms of botulism would appear within hours—cramps, nausea, and double vision, progressing without treatment to difficulty swallowing, paralysis, and death by asphyxiation.(75) Although treatment exists, limited availability of mechanical ventilators and antitoxin could result in a death rate of 60 percent.(76) Children would be expected to be hit first and hit hardest, because of the bypassing of the grocery-distribution system in milk destined for schools, which is shipped directly from the processing plant. Of U.S. school kids, the lead investigator told a reporter, “They’d be the canaries.”(77)

The U.S. government tried to block the release of their report, fearing it could be used as a “road map for terrorists,” but the National Academy of Sciences published it over the objections, pointing out that nothing divulged in the report was not “immediately accessible on the World Wide Web through a simple Google search.”(78) Indeed, in an opinion-editorial printed in *The New York Times* entitled “Got toxic milk?,” one of the Stanford investigators noted that “Preparation of Botulism Toxin,” a manual, was already readily available on several jihadist web sites.(79)

The Stanford report suggests a number of simple changes the dairy industry could implement to enhance the safety of the U.S. milk supply, such as testing large batches of milk for the presence of the toxin before distribution. The cost of the safety measures was estimated not to exceed a few pennies per gallon.(80) In response, the dairy industry claimed it would enact some of the guidelines (though not the testing) on a voluntary basis. “Let’s face it,” the researchers responded, “in the hands of a terrorist, a dairy is just as dangerous as a chemical factory or nuclear plant, and voluntary guidelines are not commensurate with the severity of the threat.” The lead researchers concluded that “Americans are blessed with perhaps the most efficient food distribution network in history, but we must ensure that the system that makes it so easy to cook a good dinner doesn’t also make it easy for terrorists to kill us in our homes.”(81) Eggs are also considered one of the five most likely targets of agroterrorism by the U.S. Department of Homeland Security.(82)

Given the reported ease by which a single terrorist could disrupt a significant fraction of the U.S. economy, as well as potentially kill thousands and terrorize millions, former Health and Human Services Secretary Tommy G. Thompson remarked in his farewell address: “For the life of me, I cannot understand why the terrorists have not attacked our food supply, because it is so easy to do.”(83) Curtailing the long-distance live transport of animals—as well as the concentration and intensification of the food animal industry—could be matters of national security.

Conclusion

The FAO describes live animal transport as “ideally suited for spreading disease,” given that animals may originate from different herds or flocks and are “confined together for long periods in a poorly ventilated stressful environment.”(84) Given the associated “serious animal and public health problems,” the Federation of Veterinarians of Europe has called for the replacement of the long-distance transportation of live animals for slaughter as much as possible to a “carcass-only trade.”(85) With increased farm animal production on a global scale and the heightened risk of bioterrorism in today’s political climate, long-distance live animal transport poses an unnecessary yet significant threat to public health.

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