

The Threat of Agroterrorism and Zoonotic Diseases in the United States

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Abstract: The threat of agroterrorism and naturally occurring disease outbreaks in the United States continues to expand as new diseases emerge and existing diseases become endemic in many parts of the world. This paper and the associated presentation at NCT CBRNe US 2016 will discuss the risk of an agroterrorism attack, steps to safeguard the food supply, strategies for controlling disease outbreaks and the significance of the human/animal interface.

Keywords. Agroterrorism, Counter-Agroterrorism, Food Defense, Food Security, Emerging Infectious Disease, Foreign Animal Disease, Zoonotic Disease, Avian Flu

DEFINITIONS

- **Agroterrorism** is the deliberate introduction of a disease agent, either against livestock or into the food chain, for the purposes of undermining stability and/or generating fear.
- **Emerging Infectious Diseases (EIDs)** are new, reemerging or drug-resistant infections whose incidence in humans has increased within the past two decades or whose incidence threatens to increase in the near future.
- **Zoonotic Diseases** are any infectious diseases that can be transmitted (in some instances, by a vector) from other animals, both wild and domestic, to humans or from humans to animals.

INTRODUCTION

The food and agricultural sector is one of the easiest sectors of any nation's economy to disrupt and its disruption could have catastrophic consequences both nationally and regionally. Both developing and developed countries will be impacted by a disease outbreak or agroterrorism attack. For countries with agriculture as a significant portion of their gross domestic product, disruptions anywhere along the food chain could lead to food insecurity and national instability in addition to the direct and indirect economic impacts. In countries with a significant agricultural export market like the United States whose agricultural exports hit \$152.5 billion in 2014, disruptions to those markets would be financially devastating. Analysts estimate that a foot & mouth disease (FMD) outbreak in the US could cost between \$7 and \$13.5 billion. Yet in the context of CBRNe planning, preparations for a major biological emergency, whether naturally occurring or intentional, are often given less attention and allocated fewer resources than chemical or radiological events due to the reduced potential for a significant human death toll. However there are steps—some easily accomplished, others more difficult—that can be taken to mitigate the impact of disease outbreaks and agroterrorism activities.

Today's modern food production systems are complex with exploitable vulnerabilities throughout. The vast nature of the system provides many opportunities for the introduction of contaminants or disease agents. The simplified food supply chain shown in Figure 1 illustrates these potential points of disruption.

In addition to the significant economic consequences of an attack and the difficulties associated with securing all links in today's food production systems, there are other factors which make agriculture an attractive target. Farms are often widely dispersed and have little or no physical security. Also, plant and animal pathogens are easier to acquire than human agents and disseminating these pathogens presents less risk to the perpetrator. Finally, many of the disease agents have incubation periods of several days to weeks during which time the disease could spread undetected and the perpetrators escape.

HUMAN AND ANIMAL HEALTH

Over the last few decades we have seen a dramatic increase in the occurrence of new diseases in both humans and animals. These diseases, often referred to as Emerging Infectious Diseases (EIDs), are those new, reemerging or drug-resistant infections whose incidents in people have increased in recent years or threaten to increase in the near future. Zoonotic diseases—diseases that can be transmitted from animals to humans or from humans to humans—comprise as much as 75% of all emerging human infectious diseases. The increasing prevalence of these diseases can be contributed to a number of factors:

- **Population Growth**—Crowding results in more opportunities for existing disease organisms to mutate, recombine, and reassort into more deadly strains.
- **Land Use**—Contamination of water resources, deforestation and other land use changes result in more contact between humans, domestic animals, wildlife and vectors.
- **Agricultural Practices**—Open agriculture, deforestation, intensive agriculture and the use of antibiotics in food animals all impact the potential for disease emergence.
- **International Trade and Commerce**—An individual infected with an EID can be anywhere in the world within hours. Food is imported and exported around the world. Exotic pets are traded through legal and illegal markets.

Many of the diseases causing death and suffering across the globe are diseases that can be transmitted from animals to humans. Bats are thought to be the natural reservoir of the Ebola virus that has claimed the lives of more than 11,000 individuals in west Africa. Mosquitos are the vector that spreads the Zika which is projected to infect as many as 4 million people by the end of 2016. The effective treatment, control and eradication of these diseases require an understanding of the interconnectedness of humans, animals and the environment.



With the emergence of new diseases comes the increased risk of an intentional introduction. Reporting by the World Organization for Animal Health (OIE) includes numerous disease events each week including a number of diseases with a significant potential for use as an agroterrorism agent such as Foot and Mouth Disease (FMD), avian influenza, classical swine fever, and Newcastle disease. The increasing global presence of these disease agents increases the risk of an intentional introduction to an uninfected country. Unlike nuclear, chemical and radiological threats, the weaponization and delivery of these disease organisms is simple and comparatively inexpensive. FMD, for example, could simply be obtained from the mucus of an infected animal, transported to the target country and transferred to animals in an uninfected herd.

Since 1996 when the H5N1 “bird flu” virus was first isolated from a farmed goose in the Guangdong Province of China scientist and health officials have been carefully monitoring H5N1 and more recent strains like H7N9 and H10N8. Although the human mortality rate is nearly 60%, the virus does not spread easily from human to human. Most cases can be linked to exposure to poultry. The nightmare scenario for global health officials is a mutation that results in a virus that is not only highly lethal but also highly contagious like the Black Plague that killed as much as a third of the world’s population in the 14th century. Advances in bioengineering now allow scientist to identify the necessary mutations and generate highly contagious strains. In 2012 researchers sparked a fierce debate between the scientific and security community following their announcement that they had created an H5N1 virus that was highly contagious in ferrets—an animal often used to model human infection. As scientist use this research to learn how to prevent diseases, those in the security community worry that, in the wrong hands, the technology could be used to weaponize existing diseases.

FEASIBILITY OF AN AGROTERRORISM ATTACK

The history of bioterrorism confirms that naturally occurring disease agents such as plague, smallpox and anthrax are often used as weapons. Occurrences of reportable animal diseases published by the World Organization for Animal Health (OIE) over the last 12-months include

numerous disease events in the region including anthrax, low pathogenic avian influenza (LPAI), highly pathogenic avian influenza (HPAI), classical swine fever, foot and mouth disease (FMD), and Newcastle disease.

The 2015 outbreak of Highly Pathogenic Avian Influenza (HPAI) in the United States is another illustration the economic impact of an avian influenza outbreak. Between December 19, 2014 and June 17, 2015, 219 detections of HPAI have been reported across the country resulting in the death—either directly from the virus or in an effort to prevent the spread of the disease—of nearly 50 million birds. The total cost of the outbreak extends well beyond the cost of destroying and disposing of



the birds and includes lost market opportunities from trade restrictions. Eighteen countries banned US poultry products including Russia, China, South Korea, and Thailand. Thirty-eight countries have instituted regional restrictions including Canada, Mexico, Japan, Singapore and the European Union. Recent estimates put the total economic impact of the 2015 outbreak at over \$3 billion dollars U.S.

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HARDENING AGRICULTURAL TARGETS

Just as vulnerabilities exist throughout the entire food production system, mitigation measures are available to manage risk at each step. The first step

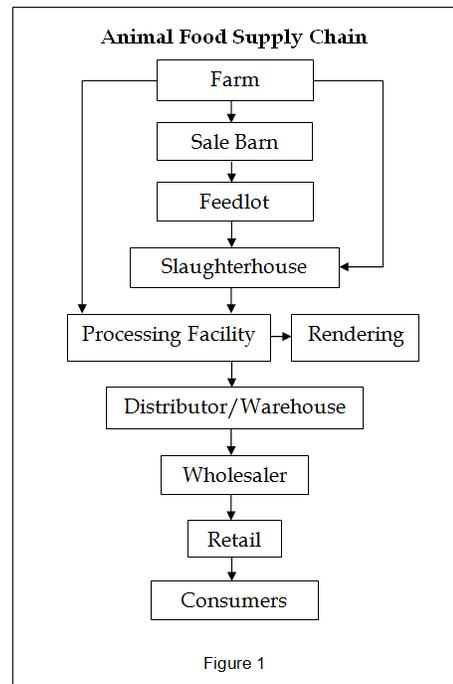


Figure 1

towards mitigation is to assess the risk factors. The tool most commonly used is the CARVER + Shock process. CARVER is an acronym for criticality, accessibility, recuperability, vulnerability, effect, and recognizability. Shock is the assessment of the combined health, psychological and collateral impact of a successful attack. By assigning a value to each of these factors, planners can determine an overall assessment of vulnerability for each step in a food production system. An individual operation can use the CARVER + Shock process to identify a specific area of their operation where they can take steps to reduce their attractiveness as a target.

Adequately addressing the threat of agroterrorism requires action at many different levels. In recent years significant progress has been made to address food defense at the international, regional, national, and provincial levels. Efforts by OIE and the World Health Organization (WHO) have resulted in significant improvements in disease surveillance and reporting. Efforts to control H5N1 in Vietnam have shown how vaccination programs, modern disease reporting systems, movement control and an aggressive public awareness campaign can limit disease spread and save lives. Malaysia's efforts to control the Nipah virus demonstrated the value of designating specific farming areas and the establishment of a national zoonotic disease committee to coordinate human and animal health efforts.

Despite more than a decade of extraordinary effort by dedicated men and women focused on hardening agricultural and food production targets, there is one place where the level of preparedness remains virtually unchanged—the farm. A culture of independence, shrinking profits, limited organizational support and the vast number of individual farms have conspired to impede the implementation of key physical and biosecurity measures. Today the farm represents one of the greatest vulnerabilities in the entire food production system.

However there are steps—some easily accomplished, others more difficult to implement—that can be taken to prevent agroterrorism attacks on the farm. Simple measures include:

- Limit access with fencing and locks
- Post signs to designate restricted areas and farm policies
- Keep all buildings and gates lock when not in use
- Pre-screen new employees
- Improve facility lighting
- Park vehicles away from livestock areas
- Isolate new animals from the main herd



- Train personnel to recognize disease signs and implement appropriate biosecurity procedures
- Build relationships and maintain contact information for:
 - Herd veterinarians
 - Government veterinarians
 - Local law enforcement
 - Public health officials
- Maintain an inventory of all animals on the farm
- Document and safely dispose of all animal mortality

These are just a few of the simple measures that can be taken to mitigate an individual farm's vulnerability to an agroterrorism attack. Because the effectiveness of local, national or regional efforts is hampered if these on-farm vulnerabilities are not addressed, it is incumbent on all partners in the counter-agroterrorism effort to support on-farm mitigation measures. Additional efforts in the area of education, resources and coordination may be key to preventing the next devastating agroterrorism attack.