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CHEMICAL, BIOLOGICAL & NUCLEAR WARFARE

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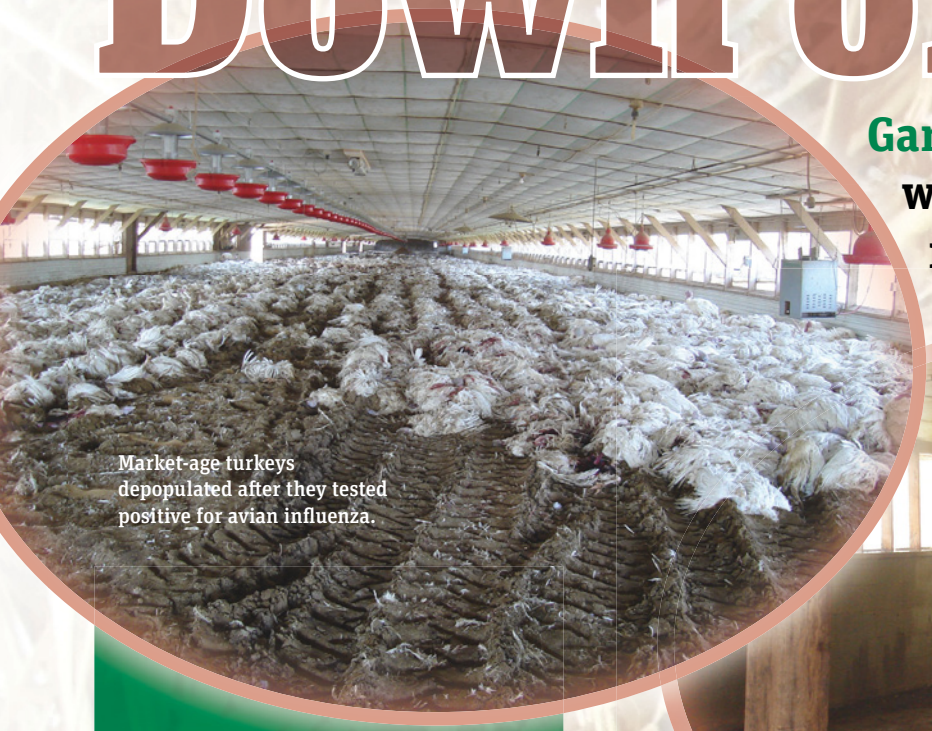
THREATS TO TRANSIT
On land and sea

COUNTRY FOCUS
India

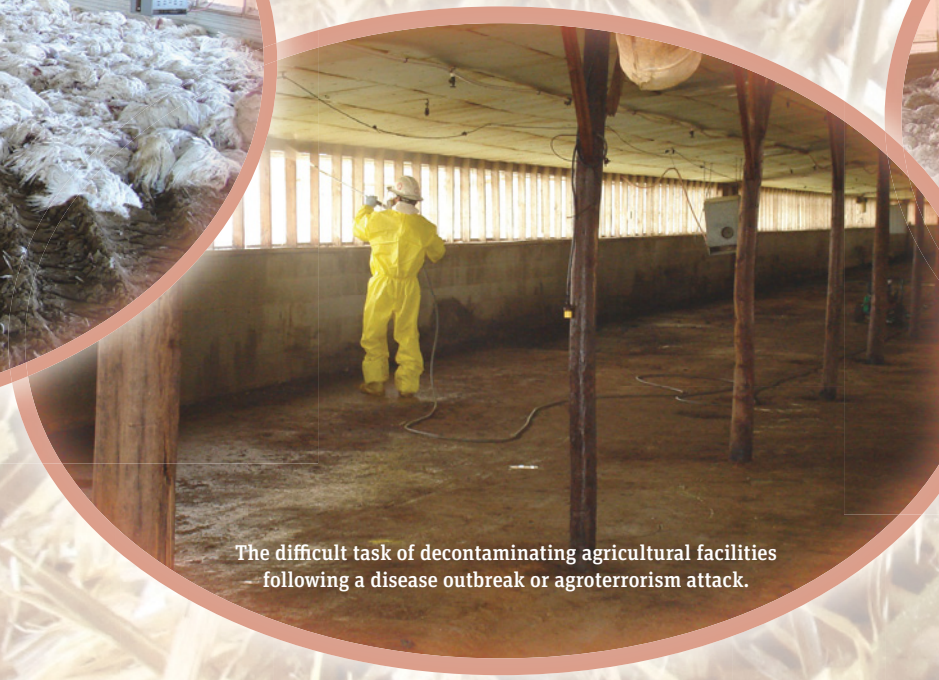
IS IT MOTHER NATURE?
Defining bioterrorism

Down on the

Gary A. Flory explains how we can understand and respond to agroterrorism



Market-age turkeys depopulated after they tested positive for avian influenza.



The difficult task of decontaminating agricultural facilities following a disease outbreak or agroterrorism attack.

Images: @2013 Gary Flory

On 12 March laboratory results confirmed the worst: the farm's animals had tested positive for the highly contagious pathogen and would need to be destroyed. Within a few weeks the disease had spread to more than 50 farms while first responders struggled with the daunting task of destroying and disposing of thousands of animals each day. Public concern over environmental and public health threats about the carcass disposal activity increased as the outbreak continued. The burial of animal carcasses was discontinued over concerns for the fragile groundwater system. The outcry continued as smoke from burning carcasses blanketed the countryside. By the time the virus was eradicated in June, 197 farms had been infected and 4.7 million animals destroyed. In the end the total economic impact of the outbreak reached $149 million

The latest Hollywood movie? No. The scenario described above actually describes an outbreak of low pathogenic H7N2 avian influenza (AI) that occurred in the American state of Virginia in 2002. At the broadest level it could just as easily describe past outbreaks of foot & mouth disease (FMD) in the UK, South Korea and Japan or ongoing outbreaks of avian influenza in Vietnam, Cambodia and China. Although these examples are not acts of terrorism, they serve as a reminder of the impact an intentionally introduced disease agent can have on a nation.

A subset of bioterrorism, agroterrorism is the deliberate attempt to disrupt or destroy an agricultural industry or food supply by a variety of means including the introduction of a disease agent, either against livestock, crops or into the food chain, for the purposes of undermining stability and/or generating fear. Although agroterrorism does not occur frequently, it has been used for centuries to sabotage and weaken the enemy. Kenya's Mau Mau used the African milk bush in 1952 to poison cattle and the Arab Revolutionary Council used mercury to poison Israeli orange crops. Although these attacks were localized and small-scale, several factors make large-scale agroterrorism attacks increasingly more feasible.

Food as a target

The food and agricultural sector is one of the easiest sectors of any nation's economy to disrupt, with catastrophic local, national and regional consequences. Both developing and developed countries would be heavily impacted. For countries with agriculture as a significant portion of gross domestic product, disruptions anywhere along the food chain could lead to food insecurity and national instability. Yet in the context of CBRN planning, preparations for a major agricultural emergency, whether naturally occurring or intentional, are often given less attention and allocated fewer resources than chemical, nuclear, or

farm

Poultry carcasses being removed from a poultry house for disposal.

EMERGING INFECTIOUS DISEASES

Increasing prevalence is due to:

POPULATION GROWTH – Crowding enables existing disease organisms to mutate and recombine 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 increase 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.

Effective decontamination procedures are a critical component of an effective biological agent response plan.

radiological events due to the reduced potential for a significant human death toll.

Today's modern food production systems are complex with exploitable vulnerabilities throughout. Its vastness provides many opportunities for the introduction of contaminants or disease agents. As well as the significant economic consequences of an attack and the difficulties associated with securing all links in today's food production systems, agriculture is an attractive target because 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 incubations periods of several days to weeks during which time the disease could spread undetected and the perpetrators escape.

New diseases

Over the last few decades new diseases in both humans and animals have dramatically increased, especially Emerging Infectious Diseases (EIDs) – new, reemerging or drug-resistant infections. 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 impact of zoonotic epidemics from 1995 to 2008, many of them preventable, exceeded $120 billion globally.

The increasing global presence of these disease agents increases the risk of an intentional introduction to an uninfected country. Their weaponization and delivery is simple and relatively cheap. 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.

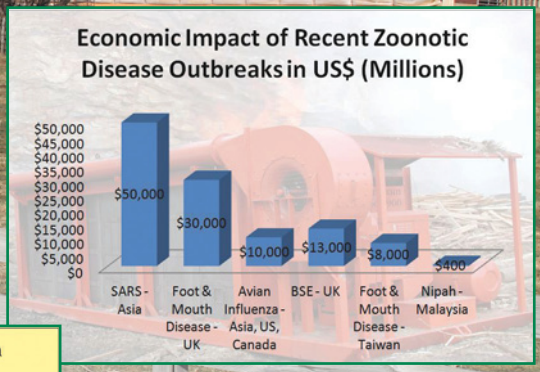
The nightmare scenario for global health officials is a mutation that results in a highly lethal and highly contagious virus like the Black Plague that killed a third of the world's population in the 14th century. Advances in bioengineering now allow scientists to identify the necessary mutations and generate highly contagious strains. In 2012 a fierce debate arose between the scientific and security community following the announcement by researchers that they had created an H5N1 virus that was highly contagious in ferrets – an animal often used to model human infection. As scientists use this research to learn how to prevent diseases, the security community is concerned that, in the wrong hands, the technology could be used to weaponize existing diseases.

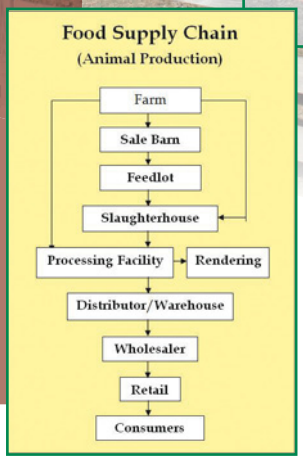
Hardening agricultural targets

Efforts by OIE (Office International des Epizooties) and the World Health Organization (WHO) have significantly improved ➤

HOW TO PREVENT AGROTERRORISM ATTACKS ON THE FARM:

- Limit access with fencing and locks
- Post signs to designate restricted areas and farm policies
- Keep all buildings and gates locked 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 and government veterinarians, local law enforcement, public health officials
- Maintain an inventory of all farm animals
- Document and safely dispose of all animal mortality





Above: Recent zoonotic disease outbreaks have had a global economic impact.

Left: This simplified food supply chain for an animal production system shows numerous points of disruption.

disease surveillance and reporting. Efforts to control H5N1 in Vietnam have shown how vaccination programmes, 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.

Tabletop and full-scale exercises are an excellent way to test and improve preparedness. On 13 July 2013 Singapore's Agri-Food and Veterinary Authority (AVA) conducted a mock exercise called Exercise Gallus VII, to test readiness for a possible outbreak of avian influenza. It tested Singapore's crises management framework and exercised their ability to don personal protective equipment, cull and dispose of poultry, and decontaminate agricultural infrastructure.

Vulnerability of farms

But the one place where the level of preparedness remains virtually unchanged is the farm. A culture of independence, shrinking profits, limited organizational support and the vast number of individual farms have impeded the implementation of key physical and biosecurity measures. Today the farm represents one of the greatest vulnerabilities in the entire food production system.

The effectiveness of local, national or regional efforts is hampered if these on-farm vulnerabilities are not addressed. Therefore 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 will also prevent the next devastating agroterrorism attack.

HIGH-CONSEQUENCE EXOTIC ANIMAL DISEASES		
DISEASE	ANIMALS AFFECTED	CLINICAL SIGNS
Foot and Mouth Disease (FMD)	Cattle, pigs, sheep, goats, cloven-hooved wildlife	Hoof and oral blisters, excessive salivation, nasal discharge
Highly Pathogenic Avian Influenza (HPAI)	Many avian species (poultry highly susceptible)	Sudden death, lack of energy and appetite, decreased egg production
Exotic Newcastle Disease (END)	Many avian species (poultry highly susceptible)	Sudden death, numerous deaths within 24-48 hours, nasal discharge, coughing, gasping for breath
Classical Swine Fever	Pigs	Fever, piling or huddling, loss of appetite, weakness staggering, diarrhoea
Nipah	Pigs, horses (also zoonotic)	Fever, open mouth breathing, rapid and laboured respiration
Rinderpest	Cattle, pigs	Sudden onset of fever, depression and loss of appetite, reduced milk production
African Swine Fever (AFS)	Pigs	Fever, reddening of the skin (especially tips of ears and tail)
Venezuelan Equine Encephalitis	Horses, donkeys, zebras	Fever, depression, loss of appetite, lack of coordination, chewing movements, head pressing

Exotic animal diseases have the potential to have catastrophic economic consequences when introduced into a disease-free country.

Gary A. Flory is the Agricultural Program Manager for the Virginia Department of Environmental Quality and an advisor, trainer and public speaker in the areas of emerging infectious diseases, counter-agroterrorism, One-Health, animal carcass disposal, and agricultural facility decontamination.

Through exercises like this one, first responders can prepare to respond to bio-attacks.