COMMENTARY

ONE HEALTH SECURITY: AN IMPORTANT COMPONENT OF THE GLOBAL HEALTH SECURITY AGENDA

Gigi Gronvall, Crystal Boddie, Rickard Knutsson, and Michelle Colby

The objectives of the Global Health Security Agenda (GHSA) will require not only a “One Health” approach to counter natural disease threats against humans, animals, and the environment, but also a security focus to counter deliberate threats to human, animal, and agricultural health and to nations’ economies. We have termed this merged approach “One Health Security.” It will require the integration of professionals with expertise in security, law enforcement, and intelligence to join the veterinary, agricultural, environmental, and human health experts essential to One Health and the GHSA. Working across such different professions, which occasionally have conflicting aims and different professional cultures, poses multiple challenges, but a multidisciplinary and multisectoral approach is necessary to prevent disease threats; detect them as early as possible (when responses are likely to be most effective); and, in the case of deliberate threats, find who may be responsible. This article describes 2 project areas that exemplify One Health Security that were presented at a workshop in January 2014: the US government and private industry efforts to reduce vulnerabilities to foreign animal diseases, especially foot-and-mouth disease; and AniBioThreat, an EU project to counter deliberate threats to agriculture by raising awareness and implementing prevention and response policies and practices.

THE RECOGNITION THAT ANIMALS AND PEOPLE face similar disease challenges has been apparent since the term *zoonosis* was coined more than a hundred years ago to describe an infectious disease passed between animals and humans.^{1,2} About 75% of new and emerging infectious diseases are zoonotic, including Middle East Respiratory Syndrome coronavirus (MERS-CoV), which is causing sporadic outbreaks around the globe.³ While diseases affecting human health may be of immediate concern, the health of plants and animals can directly affect food security as well as economic health. Actions taken to protect animal, plant,

and environmental health can prevent economic and public health disaster.

The connectedness of humans, animals, plants, and the environment was highlighted at the 2014 launch of the Global Health Security Agenda (GHSA), the 5-year commitment by the White House, partner nations, and international organizations to significantly accelerate activities to address biological threats.⁴ Dr. José Graziano da Silva, Director-General of the Food and Agriculture Organization of the United Nations (FAO), and Dr. Bernard Vallat, Director-General of the World Organisation for Animal

Gigi Gronvall, PhD, is a Senior Associate, and Crystal Boddie, MPH, is an Associate; both at the UPMC Center for Health Security, Baltimore, Maryland. Rickard Knutsson, PhD, is Director of the Security Department, National Veterinary Institute (SVA), Uppsala, Sweden. Michelle Colby, DVM, is Agricultural Defense Branch Chief, Chemical and Biological Defense Division, Science and Technology Directorate, Department of Homeland Security, Washington, DC.

Health (OIE), explained how the animal-human interface is a source for emerging disease threats, and that the World Health Organization (WHO), FAO, and OIE will need to join in a “One Health” approach to build capacity to counter these threats. One Health is defined as the “collaborative effort of multiple disciplines—working locally, nationally, and globally—to attain optimal health for people, animals and [the] environment” through policy, research, education, and practice.^{5(p1913)}

In addition to naturally occurring biological threats, the GHSA objectives include *deliberate* threats to human, animal, and agricultural health and to nations’ economies—an approach we have termed “One Health Security.” One Health Security requires the integration of professionals with expertise in security, law enforcement, and intelligence to join the veterinary, agricultural, environmental, and human health experts essential to One Health and the GHSA. Working across such different professions, which occasionally have conflicting aims and different professional cultures, poses multiple challenges; thus, a multidisciplinary and multisectoral approach is necessary to prevent disease threats; detect them as early as possible (when responses are likely to be most effective); and, in the case of deliberate threats, find who may be responsible.

ONE HEALTH SECURITY IN PRACTICE

On January 31, 2014, experts from the US Department of Homeland Security (DHS), the Swedish National Veterinary Institute (SVA), the Swedish Civil Contingencies Agency (MSB), and the University of Pittsburgh Medical Center (UPMC) Center for Health Security spoke to a group gathered for a workshop at the House of Sweden in Washington, DC, to discuss recent examples of projects that successfully combined the One Health concept and security, as well as gaps in our knowledge and preparedness in One Health Security. The workshop participants included 40 representatives from academic institutions and nongovernment institutions in the US and Europe. They came from a range of US government agencies, including the US Department of Agriculture (USDA), the Department of Defense (DoD), the Food and Drug Administration (FDA), the Centers for Disease Control and Prevention (CDC), the Department of State, and the Department of Health and Human Services (HHS), and from Swedish government agencies and organizations including the Swedish Civil Contingencies Agency (MSB) and National Veterinary Institute (SVA), the National Board of Agriculture (SJV), the Institute for Defense and Strategic Policy Studies (IHT)/Swedish National Defense College, and the Swedish University of Agricultural Sciences (SLU).

In this article, we highlight 2 project areas presented at the One Health Security workshop that are directly related to the Global Health Security Agenda: first, the US public/private partnership to coordinate planning for deliberate introduction of agricultural diseases, including foot-and-mouth disease

(FMD); and second, AniBioThreat, a One Health Security pilot project that spanned 8 countries in the European Union to enhance awareness, preparedness, and training in response to a range of diseases including foot-and-mouth disease, botulism, and anthrax.⁶⁻⁸

FMD Preparedness

There are many known agricultural threats that have the potential to be used as biological weapons. The USDA oversees more than 30 of the 60-plus select agents and toxins, including rinderpest virus (which is now eradicated), *Bacillus anthracis*, and peste des petits ruminants virus.⁹ In addition to those known threats, new strains and variants occur regularly in nature. These biological threats may not be detected until entire herds or fields are infected because of uneven fielding of diagnostic tests.

The archetypal concern among agricultural threats, however, is FMD. FMD is endemic in Asia, Africa, the Middle East, and parts of South America, and the virus that causes the disease is relatively hardy, can survive transport, and is highly contagious among cloven-hooved animals. While FMD outbreaks have relatively no effect on human health, the economic damage of an FMD outbreak (whether deliberate or natural) would be considerable. One of the major consequences of an FMD outbreak is an alteration of trading status after the detection of FMD in previously FMD-free herds, which has a direct negative impact on the affected nation’s economy. In 2001 in the UK, a naturally caused FMD outbreak resulted in over US\$5 billion in losses and the slaughter of more than 4 million animals.¹⁰ Though estimates vary, the cost of a similar outbreak in the US could be US\$2-4 billion.^{11,12}

The Agricultural Defense Branch in DHS’s Science and Technology Directorate (S&T) has taken steps in partnership with the USDA and industry partners to reduce vulnerabilities to FMD virus, starting with an FMD vaccine program that was initiated in 2005. By 2011, foreign-manufactured, inactivated FMD vaccines were imported for enhanced characterization, and an import permit was in place for a quadrivalent vaccine from Argentina.¹³ In May 2012, the USDA Animal and Plant Health Inspection Service Center for Veterinary Biologics issued a conditional license for the first FMD vaccine ever licensed in the US, a new serotype and subtype specific molecular vaccine for FMD.¹⁴ Companion diagnostic tests able to distinguish between vaccinated and infected animals (a key impediment for FMD vaccination in the past) are in development. The program continues to work on developing vaccines for other foreign animal diseases, other novel vaccine platforms, and improved vaccines.

AniBioThreat

Another example of One Health Security presented at the January workshop was the 3-year AniBioThreat project.

AniBioThreat, grounded in science and practical experience, aimed to improve the European Union's (EU) capacity to counter deliberate biological threats to agriculture by raising awareness and implementing prevention and response policies and practices. The €7 million pilot project was initiated in 2010 in response to a 2009 European Union Chemical, Biological, Radiological and Nuclear action plan, and it was funded by the Prevention of and Fight Against Crime Programme of the European Union, European Commission, and Directorate General for Home Affairs. The "all-hazards" project created a consortium to bring together organizations from various sectors such as law enforcement, human and animal health, and academia. The consortium was coordinated by the SVA in Sweden, and there were 8 European member states in the consortium: Italy, the United Kingdom, Germany, the Netherlands, Denmark, France, Hungary, and Sweden.

In addition to the range of countries that participated in the AniBioThreat project, there was great diversity of expert participation in the fields of veterinary medicine, security, forensics, animal and public health, food safety, and academia. The focus of the project was intentionally pragmatic and operational and included superintendents, sergeants and police officers, fingerprint experts, lawyers, communicators, DNA specialists, veterinarians, medical doctors, bacteriologists, virologists, molecular biologists, agronomists, pharmacists, and modelers, who all participated substantively. In total, a staff of 170 people contributed to AniBioThreat from the law enforcement and animal and public health communities, aiming to bridge gaps in multisectoral capability. Some of these gaps included the areas of risk ranking methodologies, early warning, actionable knowledge and developing a collaborative early warning culture, and harmonization of laboratory response networks.¹⁵⁻¹⁹

In the end, the AniBioThreat project led to improved interoperability, updated contingency plans for animal threats (including animal botulism and anthrax), training events, formal exercises, a course for practitioners on early warning and strategic analysis, movies for education purposes, and, importantly, shared contacts across these diverse professional cultures. The results of the AniBioThreat project were published in a supplement to the journal *Biosecurity and Bioterrorism* in September 2013. The special issue contains 29 articles about bioterrorism threats to animals, feed, and food and the AniBioThreat experience.¹⁵

NEXT STEPS FOR ONE HEALTH SECURITY

The One Health Security workshop highlighted some additional areas where attention is needed to counter emerging threats, such as feed and food-chain resilience and emerging diseases in wildlife. Diseases that affect wildlife are relatively neglected but may affect the wild food chain, the farmed food chain (as diseases do not recognize farm fences), the economic health of the agricultural sector, and, in the case of

zoonosis, human health. There is also a great need to assess how surveillance is occurring in wildlife and whether there are appropriate response policies in place to address wildlife health. In addition, other complex health threats such as antimicrobial-resistant pathogens in animals and humans and accidental introduction of pathogens to plants, animals, or humans should be of high concern.^{20,21} Multidisciplinary approaches are needed at the local, national, and global levels to prevent and mitigate crises at the interfaces between humans, animals, and the environment.^{22,23} To ensure sustainability, the One Health Security approach to wildlife disease should be based, to the maximum extent possible, in already existing structures to conserve financial resources and avoid duplication of effort.²⁴

Even though the connectedness of humans with their environment is now generally acknowledged, the veterinary, human, and environmental health disciplines have in large part remained separate in their work and professional training. The past decade has seen great strides in changing this, including integrated surveillance initiatives,^{25,26} new education and training programs focused on One Health,^{27,28} and research to study how diseases in animals become threats to human health and how changes in the environment affect animal, human, and plant health.²⁹ The addition of security experts and professionals for One Health Security adds another layer by connecting law enforcement, public health, animal health, and plant health. The One Health Security approach is not an additional agenda but rather an important subset of the GHSA, which should incorporate law enforcement and security throughout. While this approach is necessary, and shared responsibility among security, agriculture, and health sectors is needed in the GHSA, it will remain complicated to integrate these diverse disciplines.³⁰ Nonetheless, the objectives of the GHSA depend on the integration of One Health concerns as well as security and law enforcement in order to adequately prevent, detect, and respond to emerging natural and deliberate biological threats.

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Address correspondence to:
Gigi Gronvall, PhD
Senior Associate
UPMC Center for Health Security
621 East Pratt St., Ste. 210
Baltimore, MD 21202
Email: ggronvall@upmc.edu