Bioevents Threaten National Security

Both naturally occurring infectious disease outbreaks and deliberate biological weapons attacks present significant threats to US national security. Contagious disease knows no borders; fast-moving disease outbreaks can bring great suffering, and cause long-lasting social and economic damage, as well as political unrest and destabilization. Biological weapons, developed by several countries in the last century, including the US, could deliver sudden, catastrophic casualties on civilians, crops or agricultural animals. Advances in biology and biotechnologies offer opportunities for more effective epidemic response. The global rise of biotechnology has also created simpler ways of constructing powerful bioweapons and the needed materials and methods to do so serve many legitimate purposes and are widely available.

Large-scale, lethal epidemics are becoming more frequent, affecting more people, and spreading faster and farther than has been the case historically.

Major drivers for these trends[1] include:

- **Changes in Climate and Land Use:** The warming climate is changing the geographical distribution of animals, introducing hosts that harbor potential microbial threats from tropical and sub-tropical areas into temperate zones[2].
- **Urbanization and human population growth:** Global urbanization has produced dozens of megacities with upwards of 10 million inhabitants each, most of whom suffer from poor nutrition, inadequate sanitation, and have limited access to health care. These conditions are highly conducive to the growth and spread of infectious diseases. The growing human population and ensuing economic pressures are also thrusting people into ecosystems where they are in contact with previously remote animal populations harboring unknown pathogens[3].
- **Industrialization of agriculture:** The increasingly industrialized production of meat and poultry gathers vast numbers of animals together in close contact with humans, facilitating rapid spread of disease. Animals are routinely transported over large distances. The overuse of antibiotics in agriculture is a major source of the increase in antibiotic resistance we now observe[4].
- **Increased mobility:** Modern trade and travel patterns ensure the continuous movement of people, animals, and plants at the speed of jet airliners. Political disruption is also causing the migration of people in numbers without historical precedent. Illegal trade in exotic animals – a

1 Morse, S. (1995). Factors in the Emergence of Infectious Diseases. *Emerging Infectious Diseases, 1*, 7-15.

2 Altizer S, O. R. (2013). Climate Change and Infectious Diseases: From Evidence to a Predictive Framework. *Science, 341*, 514-19.

3 Neiderud, C. (2015). How urbanization affects the epidemiology of emerging infectious diseases. *Infect Ecol Epidemiol, 5*, 27060.

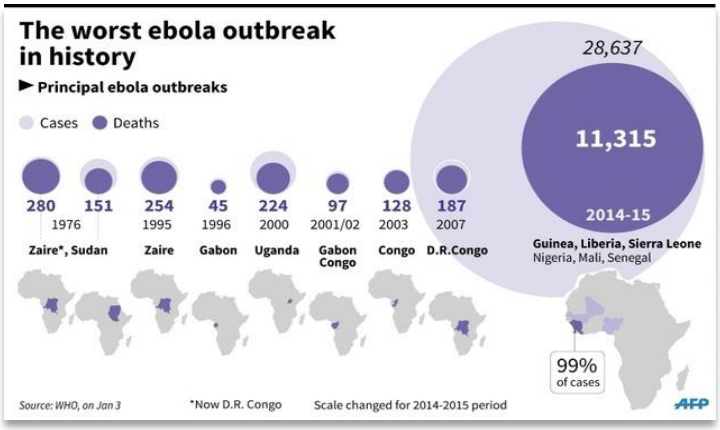
4 Liverani M, W. J. (2013). Understanding and Managing Zoonotic Risk in the New Livestock Industries. *Environ Health Perspect, 121*, 873-77.

$15 billion per year industry -has reached epidemic proportions. Inadvertent introduction of new pests via trade and travel is also a growing problem.

2009 H1N1 pandemic – arrows represent the seeding of unaffected countries due to infected individuals.
Source: The Global Epidemic and Mobility Model

The current US approach to managing infectious disease epidemics, based on traditional means of outbreak detection, vaccine design and production, and countermeasure distribution, has proven inadequate. The West African Ebola epidemic, which began in December 2013 with a single case in Guinea, and went on to devastate three countries, was not recognized as a public health emergency until August 2014. To date, the epidemic has sickened over 28,000 people and killed more than 11,000. Although the US government considered the Ebola virus a top bioterror threat and candidate for countermeasure development since 2003, no vaccine had entered safety trials by the peak of the outbreak in 2014. Not a single rapid diagnostic test was available to distinguish those infected with Ebola. The Ebola virus is not easily transmitted from one person to the next – direct contact with bodily fluids is required to infect. Yet, containment of this relatively slow-moving virus, in a largely rural setting, proved difficult and costly. The response highlighted the lack of a coherent international strategy for epidemic management.

Influenza, on the other hand, is among the most contagious of viruses. Flu largely spreads from infectious individuals through droplets in the air, generated by coughing or sneezing, to other people when they breathe in these droplets. To a lesser extent, touching contaminated surfaces and then subsequently touching one's face also transmits influenza. Beginning in 2001, when the threat of a highly lethal bird flu raised fears of a pandemic, the US government spent billions on the



Ebola outbreak timeline. Source: AFP

development of pandemic flu vaccines, even constructing a dedicated manufacturing plant. These advanced development expenses did not improve our ability to respond to the H1N1 pandemic in 2009. Vaccine supplies were not available until six months after H1N1 influenza struck in 2009. This delay in vaccine availability was too late to significantly decrease the numbers of cases. The H1N1 strain turned out to be less virulent than was feared, but in the year from April 2009-2010, CDC reported 60 million US cases with 12,469 deaths[5]. If the world were to confront a more deadly, highly transmissible emergent disease or a highly lethal strain of flu, the toll of our inability to rapidly deliver effective vaccines could result in significant social, economic, political and military instability.

Biological Weapons are strategic threats, comparable to nuclear weapons

Compared to the potentially catastrophic, world changing nature of biological weapons attacks, natural infectious disease epidemics are tepid, slow-moving tragedies. The deliberate use of bioweapons, whether by nation states, terrorist groups or lone wolf actors, represents a top tier strategic threat to US national security. The US offensive bioweapons program (ended by Presidential order in 1969) field-tested many different weapons in realistic conditions, including releases from air, boats, ships and in subways. The US Army proved – using 1960s technologies – that bioweapons have a potential destructive power equivalent to that of nuclear weapons. As the Defense Science Board attested, by 2001, advances in the life sciences and biotechnology had eliminated any technical barrier to building and disseminating highly lethal bioattacks over large areas. In the 15 years since then, the processes needed for bioweapons production, which in 2001 would have required specialized skills and training, have been simplified, automated and are widely accessible. At the same time, tremendous advances in medicine and in the pharmaceutical industry in particular have increased the number of people trained in bioscience and biotechnology.

In October 2015, the bipartisan Blue Ribbon Study Panel on Biodefense, which addressed threats from both natural infectious disease epidemics and bioweapons attacks, and whose members are former Senators, Congressmen and high-ranking administration appointees, issued its *National Blueprint for Biodefense*[6]. The Panel asserted that "*The Nation is dangerously vulnerable to biological events…The Nation has not come to fully appreciate the severity of the biothreats and our leaders have not demonstrated the political will to fully address it…. Simply put, the nation does not afford the biothreats the same level of attention it does other threats."[vii]*

The Study Panel delivered 33 recommendations for action, covering all aspects of biodefense. The recommendations include a call for the Vice President to be put in charge of biodefense, the creation of a comprehensive biodefense strategy and unified budget, and improved management of the biodefense intelligence enterprise. The report also advocates for a *"much greater focus on innovation than ever before – because biological threats are imminent, biological vulnerabilities have existed for too long, and the complexity of the threat requires equally complex solutions."*

---

5 CIDRAP. (2012, June 27). *CDC estimates of global H1N1 pandemic deaths: 284,000*. Retrieved February 20, 2016, from http://www.cidrap.umn.edu/news-perspective/2012/06/cdc-estimate-global-h1n1-pandemic-deaths-284000

6 Blue Ribbon Study Panel on Biodefense. *A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts.* October 2015. http://www.biodefensestudy.org

The Study Panel notes the numerous Commission reports and Congressional hearings calling for a more innovative and improved biodefense. In the decade since President George W. Bush supported and funded the creation of the Biological Advanced Research Development Agency (BARDA) in HHS, and in the almost two decades since President Clinton first requested dedicated budgets for biodefense, the country has demonstrated little improvement in its ability to fight epidemic disease. The innovations needed to defeat bioattacks or large-scale natural epidemics must be much more technologically ambitious, and more integrated into routine public health and medical practice than anything yet envisioned by existing government programs.