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Impact of an Epidemic Caused by Biological Warfare and Prevention Strategies for Future

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ABSTRACT: Biological weapons are devices intended to deliberately disseminate disease-producing organisms or toxins in food, water, by insect vector, or as an aerosol. As would be the case following exposure to any infectious disease, those infected would experience an incubation period of variable duration, depending on the pathogen, the size, and route of the inoculum, and the immune response of the affected persons. The incubation period could be days to weeks. If sufficient numbers of people were infected by the dispersal of a biological weapon, or if the agent were contagious and person-to-person transmission outran disease control measures, the result could be large-scale, possibly catastrophic epidemics. It is this outcome—the prospect of a pestilence intentionally unleashed on large civilian populations—that most concerns physicians, public health experts, and political leaders.

Because of the increased threat of terrorism, the risk posed by various microorganisms as biological weapons needs to be evaluated and the historical development and use of biological agents better understood. Biological warfare agents may be more potent than conventional and chemical weapons. During the past century, the progress made in biotechnology and biochemistry has simplified the development and production of such weapons. In addition, genetic engineering holds perhaps the most dangerous potential. Ease of production and the broad availability of biological agents and technical know how have led to a further spread of biological weapons and an increased desire among developing countries to have them.

We can never create a perfect system to safeguard against terrorist use of a biological agent. But conscientious preparation—to the greatest extent that budgets and available methods allow—will reduce anxiety and greatly mitigate the consequences of an actual attack. Part of that preparation should involve research and development on needed tools and approaches. These include modeling techniques, bioforensics, methods for defining threats, specific and broad-spectrum antibiotic and novel antiviral agents, and means for rapid vaccine fielding. Once an attack has occurred, a better prepared and reinforced health and agriculture response system will be needed, as will be a reliable and consistent communications plan. For those exposed, protocols for treatment and decontamination must be available. And for animal and plant exposures, an effective disposal and decontamination plan must be in place.

I.INTRODUCTION

A biological attack by terrorists or a national power may seem more like a plot element in an action film than a realistic threat. And indeed, the possibility of such an attack may be very remote. Bioweapon threats could include the deliberate release by attackers of an agent that causes one or more of a variety of different diseases. Public health authorities have developed a system to prioritize biological agents according to their risk to national security. Category A agents are the highest priority, and these are disease agents that pose a risk to national security because they can be transmitted from person to person and/or result in high mortality, and/or have high potential to cause social disruption. The draft Model State Emergency Health Powers Act of 2001, which is a document designed to guide legislative bodies as they draft laws regarding public health emergencies, has defined bioterrorism as “the intentional use of any microorganism, virus, infectious substance, or biological product that may be engineered as a result of biotechnology, or any naturally occurring or bioengineered component of any such microorganism, virus, infectious substance, or biological product, to cause death, disease, or other biological malfunction in a human, an animal, a plant, or another living organism in order to influence the conduct of government or to intimidate or coerce a civilian population.” Biological warfare and bioterrorism are often used interchangeably, but bioterrorism usually refers to acts committed by a sub-national entity, rather than a country.[1]

The ongoing COVID-19 pandemic has far-reaching implications as people face unemployment, diminishing returns on their purchasing power and the prospect of an ensuing recession. These challenges will be faced in the coming year despite stimulus packages announced by the Canadian government to mitigate the downturn. Unsurprisingly, comparisons with the Great Depression and the 1918 flu pandemic have drawn parallels to receding markets and the pandemic. Concerns over coronavirus being a bioweapon have flourished, despite being a novel, naturally occurring pathogen dispersed globally through free trade and international travel. However, an equally dangerous incident involving bioterrorism should not be ignored.[2,3]

The pandemic's effect on the world isn't a conventional attack on government targets or the military. Rather, it's a widespread and indiscriminate attack on global citizens and the economy. This outbreak has directly impacted the lives of billions of people, making it the most effective model for future terrorist activities and a new model for circumventing the conventions of modern warfare.

II. DISCUSSION

In the weeks following the spread of the novel coronavirus, also known as COVID-19, conflicting news reports, misinformed research, and conspiracy theorists all led to allegations that China was once again building bioweapons and that this recent disease outbreak was the result of an accidental release of a new biologically engineered pathogen. At the center of the controversy was the Wuhan Institute of Virology (WIV) of the Chinese Academy of Sciences (CAS). WIV is one of 20 separate biomedical research institutes in CAS, but it is the only institute specializing in virology, viral pathology, and virus technology.² It contains five research centers, including the Center for Emerging Infectious Disease, Chinese Virus Resources and Bioinformatics Center, Center of Applied and Environmental Microbiology, and the Department of Analytical Biochemistry and Biotechnology.³ Recently, it also became China's first, and only, biosafety level 4 (BSL-4) laboratory. BSL-4 labs operate under the strictest levels of biological safety as the lab work done inside these labs often deal with dangerous and exotic microbes like Ebola, Marburg,⁴ and as some people originally speculated, the coronavirus.[4,5]

It was in mid-January 2020 that the virus was first linked to bioweapons research at the WIV. It started as a minor rumor before turning into a full-blown conspiracy theory. It was not until *The Washington Post* published the main dissent titled, not so subtly, "Experts debunk fringe theory linking China's coronavirus to weapons research" that people began to look farther than the clickbait.⁵ *The Washington Post* cites multiple US experts who use both logic and analysis to debunk the rumors. First, the WIV is not suited to bioweapons research. Any bioweapons research would likely need to remain covert, as bioweapons are outlawed by the Biological Weapons Convention. In contrast, the WIV is well-known, open, and linked with other labs around the world, including the Galveston National Laboratory in Texas.⁶ That sort of publicity and reputation could make it hard for the lab to operate secretly.

Second, experts in virology, including Richard Ebright, a chemical biology professor, and Tim Trevan, a biological safety expert, have indicated that there is no evidence that the virus was created. Ebright says, "Based on the virus genome and properties there is no indication whatsoever that it was an engineered virus."⁷ A couple weeks later, *The Financial Times* reported a similar notion. The article quoted Trevor Bradford, a virus expert and global lead coronavirus investigator, who said, "The evidence we have is that the mutations [in the virus] are completely consistent with natural evolution."⁸ It is a fact of life that viruses evolve, they get stronger, find ways of beating current vaccines, and sometimes transform into something entirely new. An example is the flu. Each year, researchers and medical professionals find new strands of the flu that make treating it an exercise in futility. It is theorized that the coronavirus went through a similar type of evolution as the flu does each year, making it a dangerous pathogen in its own right but not a biologically engineered one.

As of late February, the coronavirus had infected 77,253 people across the world, killed 2,250, affected 32 separate countries, and had already been found in seven US states. Two to three people are infected from every new case of coronavirus, meaning that the number of cases reported each day is growing exponentially.⁹ Countries around the world are setting up quarantines, implementing travel restrictions, and experiencing financial losses. A cruise ship was even refused port at multiple countries, due to COVID-19 diagnoses on board. Even the World Health Organization (WHO) is concerned.[6]

At the end of January, WHO Director-General, Dr. Tedros Adhanom Ghebreyesus, expressed concern at what the virus could do to a country with a limited health infrastructure, while simultaneously praising China for its quick and efficient containment. Overall, WHO declared a "public health emergency of international concern over the global outbreak

of novel coronavirus.”¹⁰ It has been months since patient zero was diagnosed, and yet the outbreak shows no signs of slowing down or stopping.

The coronavirus outbreak may have been an unfortunate consequence of natural evolution, but its impact is still being felt around the world. Just imagine if the outbreak was intentional, engineered to be just a little more fatal, or released in multiple areas at the same time. [7]

Bioterrorism and its potential for mass destruction have been subjects of increasing international concern. Approximately 17 countries (including five implicated as sponsors of international terrorism) may have active research and development programs for biologic weapons (1). Moreover, groups and individuals with grievances against the government or society have been known to use or plan to use biologic weapons to further personal causes.

Only modest microbiologic skills are needed to produce and effectively use biologic weapons. The greatest, but not insurmountable, hurdle in such an endeavor may be gaining access to a virulent strain of the desired agent. Production costs are low, and aerosol dispersal equipment from commercial sources can be adapted for biologic weapon dissemination. Bioterrorists operating in a civilian environment have relative freedom of movement, which could allow them to use freshly grown microbial suspensions (storage reduces viability and virulence). Moreover, bioterrorists may not be constrained by the need for precise targeting or predictable results.

The impact of a bioterrorist attack depends on the specific agent or toxin used, the method and efficiency of dispersal, the population exposed, the level of immunity in the population, the availability of effective postexposure and/or therapeutic regimens, and the potential for secondary transmission. Understanding and quantifying the impact of a bioterrorist attack are essential to developing an effective response.[8]

III.CONCLUSION

The Indian government along with friendly nations need to pool their resources and make major investments in the research and development of state-of-the-art devices that are capable of instantaneously detecting lethal bacteria and viruses in the environment. Clinical labs capable of deploying cutting edge technologies need to be set up. Also, the production and stockpiling of new vaccines needs to be increased. A surveillance system should be set up nationwide that should be staffed with clinicians and veterinarians who are trained to identify a bioweapon attack immediately after such a weapon is unleashed. Advanced countries like the Netherlands and Israel have already initiated such steps. Consequently, a nationwide response plan against any bioweapon attack is in place.[9,10]

The threat posed by bioterrorism is huge. Several major military powers have now included bioweapons in the category of Weapons of Mass Destruction. The Indian Government must be all set, every step of the way to fight bioterrorism. Because a country that is able and organized in the face of adversity has already won half the battle.

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