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Biosecurity: Understanding the Challenges and the Necessity of a Comprehensive Approach

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Since the outbreak of the COVID-19 pandemic, biosecurity has become a critical issue for statesmen. The COVID-19 pandemic has brought about numerous challenges in the public health sector. Therefore, it has become imperative to deal with biosecurity threats. In simple terms, biosecurity refers to the significant work concerned with the strategy, efforts and planning to protect living species along with environmental health from biological threats. Biosecurity is the process of enhancing security by reducing exposure to harmful biological agents. The main goal of biosecurity is to protect against or lower the risks posed by various forms of diseases and organisms. The pandemic has already proven that biosecurity threats transcend beyond borders, and there should be a concerted global approach to counter such threats. This commentary will delve deep into the challenges posed by biosecurity and the way forward to mitigate them.

Understanding and Meeting the Biosecurity Challenges

There are two major biosecurity challenges: infectious diseases and biological weapons. Throughout the course of human history, infectious diseases have affected vast populations across the world. Infectious diseases point out the disorders which have been caused by organisms in the form of bacteria, viruses, fungi or parasites. These diseases have the capacity to cause more damage than warfare. Three major pandemics had reshaped the course of biosecurity challenges even before the plague was discovered. The first plague which came to light was the Plague of Justinian I which led to almost 10,000 deaths per day. According to recent estimates, 100 million deaths wiped out almost half of Europe's population. Another major example includes The Black Death of the fourteenth century. Approximately 25 million people amounting to one-third of Europe's total population back then, lost their lives due to the plague. The Black Death transcended continents as it spread through to Asia, Europe and North America. There is evidence of plague existing in various parts of the world, mostly prevalent in the African continent. Between 2004 and 2014, a number of 4,630 cases and 349 deaths were concerned with plague in the Democratic Republic of Congo. The outbreak of the COVID-19 pandemic has instituted a change in the policy concerned with multilateralism as the supply chains have been disrupted all over the world. The pandemic has also affected the way in which nations treat each other based on the premise of globalization. Hence, infectious diseases can bring forth detrimental consequences for nations.

The other major challenge which is concerned with the biosecurity arena relates to biological weapons. There are instances where the terrorist organizations and military have weaponized infectious diseases and transformed them into biological weapons. However, the use of biological weapons in war was seen during World War II. The other notable such instance was seen during the Persian Gulf War of 1990 to 1991 when Iraq weaponized large amounts of biological agents during Saddam Hussein's regime. Biological weapons can create havoc, and the best case studies refer to the Hiroshima and Nagasaki atomic bombings. The death tolls were approximately 140,000 in the case of Hiroshima and 74,000 in the case of Nagasaki. The extensive destruction of infrastructures is beyond imagination, and the nuclear radiation has killed even more people following the bomb attack. Psychological trauma afflicted the survivors who witnessed the horrific consequences. Later on, the landmark Biological Weapons Convention (BWC) came into force and proscribed all forms of activities concerned with the use of biological weapons. According to the current scenario, 170 nation-states have already ratified this historic treaty which can help to build a world with less hostility. There is also a significant danger stemming from bioterrorism as the harmful biological agents can be used as weapons by terrorists. Hence, it is necessary to eradicate the use of biological weapons in order to create a safer and peaceful world.

It is crucial to mitigate the challenges concerned with biosecurity. Figure 1 below shows the necessary ways. The foremost priority is to discover the complications and variations in the rearing system irrespective of its location, being the house, poultry or farms. The next step is to acquire knowledge and learn as many lessons as possible. Then it becomes imperative to be aware of any form of disease outbreak. Antimicrobial reduction is also another major factor. Subsequently, the global movement of human beings and animals needs to be monitored constantly. Finally, consumer behaviours need to be kept in check always.

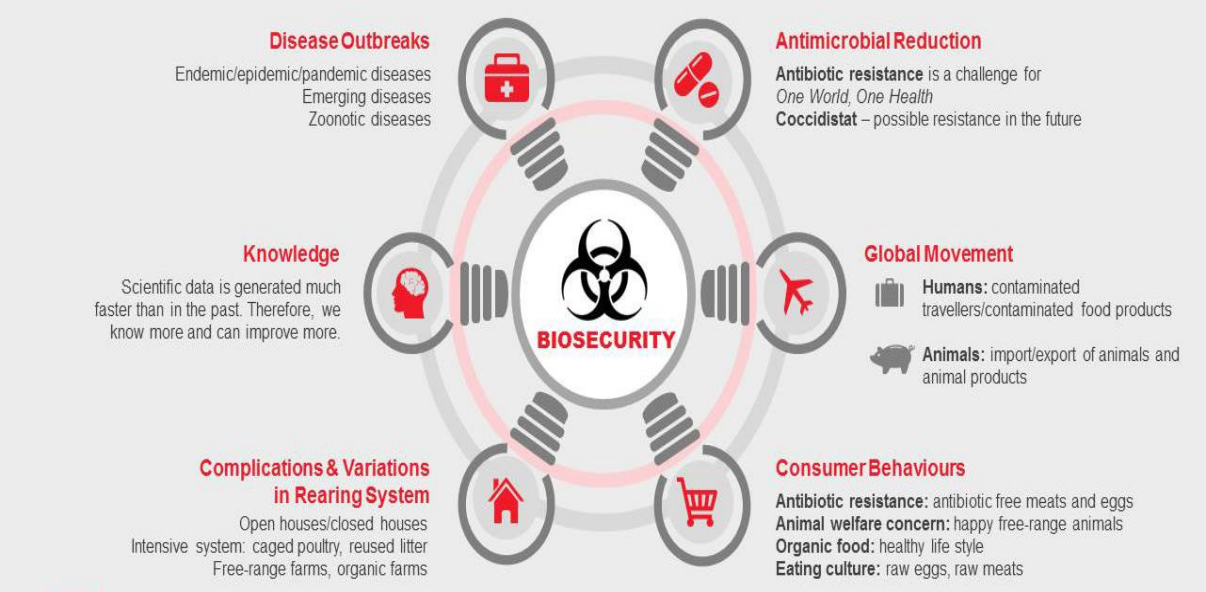

Figure 1: Steps to Tackle Biosecurity Challenges (Source: Lanxess)

The COVID-19 Pandemic: Addressing the Importance of Biosecurity

The COVID-19 pandemic has made a new revelation to the world on the significance of biosecurity to all the nations in the world. 2019 novel coronavirus (2019-nCoV) is a zoonotic disease that has been transferred from animals to humans in the initial stage. Later on, the disease was also transferred from humans to humans. The COVID-19 pandemic amounted to 4,874,672 deaths as of October 12, 2021, and the number is increasing day by day. This enormous number pertaining to the loss of lives has shaken the priority areas of policymaking for many parts of the world. The pandemic has drastically marked the importance of addressing biosecurity threats. COVID-19 has been the most severe case of any pathogen that has ever surfaced. It is changing its form from time to time to make a drastic impact on the victims. The long list of pathogens already include SARS, MERS, Ebola, H1N1 and avian flu, so; it cannot be stated that COVID-19 is an exceptional case. There are also certain risks associated with engineered pathogens which may be used to attack the citizens of a particular country. Dealing with such pathogens require drafting a priority action plan in order to enhance biosecurity. Combating such severe outbreaks require adequate resources, suave coordination and incorporating governmental organizations. COVID-19 has also shown how the interconnectedness of the international community plays a vital role in terms of curbing the outbreak of a global pandemic. It is difficult for any country in the world to continue biosecurity efforts all on its own as there is no substitute for global cooperation.

The COVID-19 pandemic has also proven that biosecurity efforts can easily become muddled. The governments have taken a wide range of steps such as purchasing Personal Protective Equipment (PPE), masks, sanitizers, executing social distancing measures, carrying out widespread vaccination campaigns and imposing travel restrictions, among others. The success of authorities in carrying out the tasks related to the biosecurity mission depends a lot on the role of the private sector. Firms in the private sector are heavily involved in the production sector concerned with the biosecurity industry, and they also produce medical equipment. More emphasis must be given on biotechnological advancements and bio-economy as biosecurity will become a crucial element of national security. Therefore, COVID-19 has proven that only state-of-the-art production technologies can help to improve biosecurity.

Way Forward

Figure 2 below shows how integrated measures can help to take a comprehensive approach in order to put emphasis on biosecurity as a critical juncture in the nation’s priority area. The first step is to conduct risk assessments based on the current scenario. After evaluating all the possible risks, the next step is to manage biosecurity in specific sectors/compartments. The third step is to adopt a national biosecurity management system which will provide guidelines on the management of biosecurity incident response and inceptive recovery operations. The fourth and

final step is to adopt a sustainable national aquaculture system that will functionally address the food security, livelihood security, employment and nutritional factors. Therefore, a comprehensive approach is a way forward in terms of addressing the key biosecurity challenges.

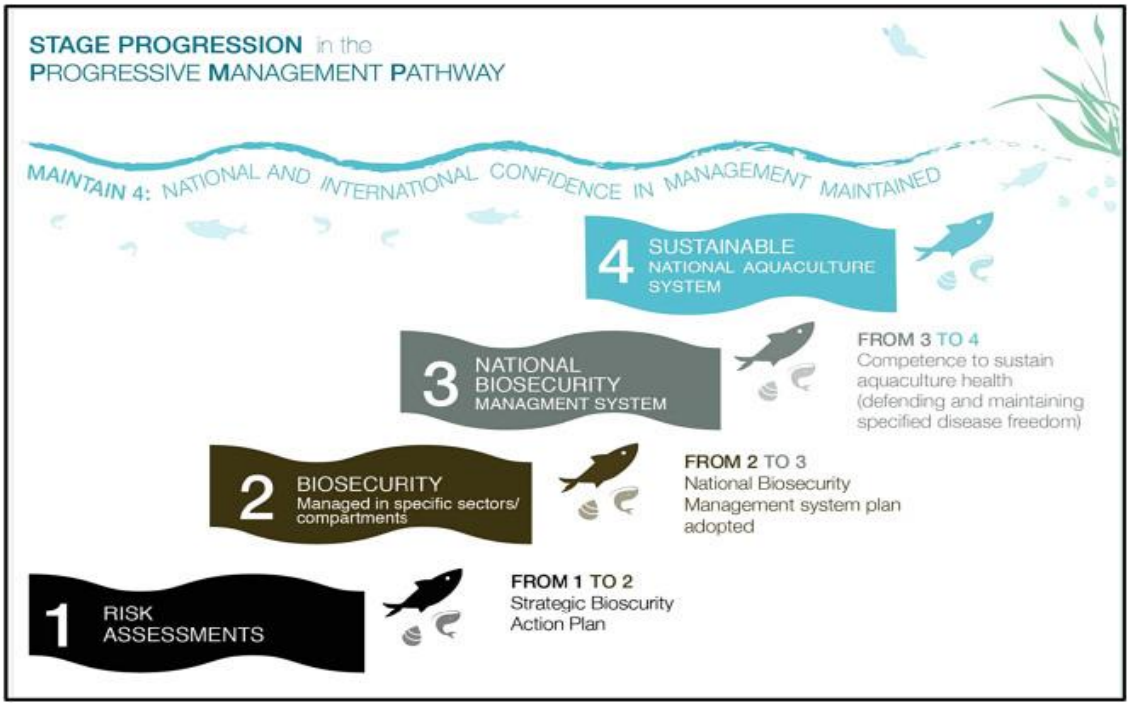

Figure 2: Stage Progression in the Progressive Management Pathway for Biosecurity (Source: ScienceDirect)

Conclusion

Biosecurity has become an integral part of our lives, and it needs to be dealt with in a careful manner. Poorly executed biosecurity practices can perhaps lead to another outbreak of the pandemic or similar situations. A well-crafted biosecurity plan will lead to numerous tangible benefits and fewer losses. Therefore, it is evident that biosecurity is the most important determinant in terms of ensuring the health and productivity of livestock across the globe. Otherwise, the world might see another pandemic that will disrupt the supply chain system and question the multilateral world order.

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