



Editorial

Opportunities and challenges after biosecurity legislation — What we can and should do in environmental science and ecotechnology?



When we generally talk about biosecurity, it is closely related to the potential threats to the ecological environment and human health caused by the development of biotechnology. Once the development of a certain organism suffers from natural or man-made “disturbance”, it cannot be quickly restored to its original state, thus posing a threat to other species. Nowadays, biosecurity has become a prominent system component for countries throughout the world, and it has become a global consensus to ensure and manage biosecurity through laws. The “Biosecurity Law of the People’s Republic of China” (hereinafter referred to as the “Biosecurity Law”) came into effect on 15th April 2021 (see Fig. 1).

From the perspective of ethical foundation, the concept of ecological holism leads a prominent role. Ecological holism pays attention to the value of ecosystems, species, and ecological processes and requires respect for the value of ecological systems as a whole and the natural objects it composes [1]. These concepts provide an ethical basis for the protection of the ecosystem, and meanwhile, are highly compatible with the inherent pursuit of the rule of law in biosecurity.

The Biosecurity Law focuses on the main risks in biosecurity, improves the biosecurity risks prevention and control system and mechanisms, and improves various specific risks prevention and response systems [2,3]. Targeted regulations have been made for major emerging infectious diseases, animal and plant epidemics; the research, development, and application of biotechnology [4]; the biosecurity management of pathogenic microorganism in laboratories; the administration of human genetic and biological resources; the prevention of alien species invasion and the protection of biodiversity; the countermeasures of microbial resistance; the prevention of bioterrorism attacks and biological weapons threats and other biosecurity risks.

The Biosecurity Law is a fundamental, comprehensive, and overarching law in the field of biosecurity. Its promulgation and implementation are conducive to protecting people’s lives and health, maintaining national security, improving national biosecurity governance capabilities. The law stipulates that biosecurity is a critical component of national security and aims to prevent and respond to biosecurity risks [5], protect biodiversity [6] and the ecological environment [7], promote the healthy development of biotechnology [8], promote the construction of a community with shared future for mankind, and achieve harmonious co-existence between human and nature.

The pandemic has made people realize once again that this is an era in which traditional security and non-traditional security are intertwined. In the post-COVID era, the Biosecurity Law will have a more profound impact on the development of the biosecurity system. Firstly, the Biosecurity Law focuses on biosecurity issues with biotechnology as the core, and its implementation will strengthen the management of alien species invasion and animal and plant genetic resources [9]. Secondly, biotechnology is a double-edged sword. The ethical issues arising from gene therapy to genetic testing and gene editing are very prominent challenges. The implementation of the Biosecurity Law will bring further attention and resolution to bioethics [10]. Finally, it systematically sorts out and comprehensively regulates the various type of biosecurity risks, clarifies its prevention and control system and basic regulations, fills the gaps in basic laws related to biosecurity, and is conducive to improving the biosecurity legal system.

The enactment and implementation of the Biosecurity Law have brought opportunities and challenges to research in the field of environmental science and ecotechnology. I would like to share some insights and scientific suggestions for urban aquatic ecological safety research under this context.

There is an urgent need to accelerate and explore scientific research related to ecological safety of urban water environment, an important part of biosecurity and an essential medium

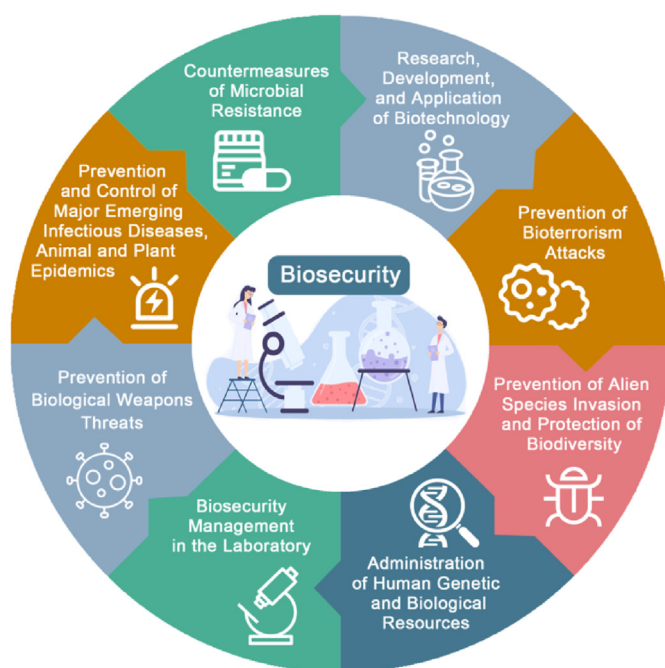


Fig. 1. The main contents of biosecurity.

connecting urban environmental networks. Five actions shall be made, i.e. (1) to identify waterborne pathogens and viruses, (2) to establish a basic database for pathogenic microorganisms including pathogens and causative diseases in aquatic environment, (3) to ascertain the potential dissemination risks and mechanisms, (4) to develop risk control technologies, and (5) to enact industrial standards. Meanwhile, we should be able to recognize the biological risk within the range of multi-matrices (water, soil and air) so as to further enrich the knowledge of potential bio-risks in the chain of the entire ecological environment while not just confined within an aquatic environment. This will provide a scientific basis for formulating effective prevention of biological risks.

As an emerging and interdisciplinary field, an ecological process of bio-risk prevention and control involves multiple disciplines and fields, including environmental science and engineering, microbiology, medicine, public health, and data science. Scholars in each related research area are obliged to collaborate with each other and jointly contribute to the prevention and control of environmental biological risks. Research institutions should strengthen the publicity and popularization of the biosecurity laws and regulations as well as the biosecurity-related knowledge, strengthen the cultivation of biosecurity and ethical awareness of students as well as researchers. As scholars in the field of eco-environment, we should strictly abide by the requirements of the Biosecurity Law, actively contribute to the restoration and improvement of the ecological environment within a reasonable and legal scope.

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