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THE EFFECTIVENESS OF BIOSECURITY POLICY REGULATION IN CHINA

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Abstract
This article examines political science issues related to biological risks and biosecurity, which have acquired exceptional significance due to a number of global processes. The increasing frequency of pandemics, the rapid advancement of genetic engineering, and the potential threats posed by biological weapons underscore the relevance of this topic. In recent decades, the accelerated spread of pathogens and the resulting epidemics have become global challenges. For example, the COVID-19 pandemic has demonstrated society's vulnerability to biological risks, simultaneously highlighting the critical need for robust biosecurity systems. At the same time, against the backdrop of globalization and the deepening of international relations, the spread of pathogens from one region to another has become faster and more uncontrollable. Biological risks pose not only a threat to public health but can also cause economic damage, disrupt ecosystem stability, and even become a national security issue. Moreover, the unpredictable consequences of the potential use of biological weapons make this topic a subject of critical scientific and political debate. These circumstances require the development of innovative and modern approaches to the effective management and prevention of biological risks. Such approaches must integrate technological, scientific, and legal solutions aimed at ensuring biosecurity at both the global and local levels. In this regard, a comparative analysis of biological risks, their impact on public health, national security, and ecosystems, as well as modern approaches to ensuring biosecurity in China, are of particular importance.

Keywords: *biosafety, biological risk, risk management, centralized management system, genetically modified organisms, biological weapons.*

Introduction

Modern countries are driven by the desire to focus their efforts and resources on preserving and strengthening not only their territorial integrity, independence, and sovereignty, but also biosecurity. In recent years, amidst the instability of international relations and the emergence of a new world order, the current political, economic, and

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military situation threatens to escalate into a large-scale international biosecurity conflict. The system for ensuring international and national biosecurity, based on economic, political, sociocultural, informational, and other aspects, represents a complex set of relationships and intentions, the implementation of which will not only preserve global peace but also strengthen the nation-state foundations of many countries. The nation state, as the primary actor in modern politics and international relations, its interests, and the traditional aspects of national biosecurity as the foundation of global and regional security, have once again become the primary focus of science and public life.

Biological risks have become one of the main challenges to health, the economy, and environmental sustainability. Modern conceptualizations of biological risks can be broadly categorized into four primary groups: infectious diseases, laboratory-acquired infections, genetically modified organisms, and biological weapons (Yassif 2017; Cameron 2017).

Infectious diseases remain one of the most significant threats to modern societies, despite humanity's evident successes in combating them. Infectious diseases are health disorders caused by pathogenic microorganisms, such as viruses, bacteria, or fungi. They can be transmitted from person to person, from animals to humans, as well as through environmental exposure (Lindahl and Grace 2015). According to the data from the World Health Organization (hereinafter referred to as WHO), infectious diseases are the second leading cause of mortality worldwide and the primary cause of premature death. According to the organization's data, approximately 2 billion people worldwide contract an infectious disease each year, of which more than 17 million result in fatalities. On a daily basis, approximately 50,000 deaths are attributed to infectious diseases[1].

Laboratory-acquired infections also constitute a significant and serious threat. In general, the highest level of biological risks is observed during work involving pathogenic microorganisms. Laboratory-acquired infections are defined as cases in which laboratory personnel become infected with pathogens present in their work environment, which are either used or stored in the laboratory. Such infections can occur for a variety of reasons, including violations of safety protocols, equipment malfunctions, or accidental release of pathogens.

Genetically modified organisms (GMOs) are considered one of the greatest achievements in molecular biology and molecular genetics. Genetically modified organisms (GMOs) are defined as living organisms whose genome has been altered through genetic engineering methods to develop specific desired traits. Through this method, the transfer, modification, or removal of genes enables the creation of organisms with new traits, the likelihood of which would be very low or impossible to achieve through natural mutations (Fuller 2022, 81). These are widely used in addressing both fundamental and applied challenges, particularly in the treatment of genetic diseases, the development of next-generation pharmaceuticals and cosmetic products, the creation of new crop varieties in agriculture, the production of transgenic animals with economically valuable traits, and other related applications. However,

[1] WHO. 2024. Global report on infection prevention and control 2024. November 29, 2024. Accessed April 10, 2026. https://www.who.int/publications/i/item/9789240103986.

alongside these possibilities, genetically modified organisms (GMOs) also pose significant risks. These risks are associated with food allergenicity, toxicity, the production of toxins, alterations to the ecological roles and functions of living organisms, the reduction of biodiversity, and other related factors (Delfosse 2005, 321-322).

Biological weapons are defined as biological agents or microorganisms that are used with the intent of mass infecting and destroying humans, animals, or plants. The basis of biological weapons lies in the intentional use of pathogens, such as bacteria, viruses, fungi, or toxic substances. Biological weapons are perceived as weapons of mass destruction that can have devastating effects, both physically and psychologically. Currently, major powers have focused their attention on biological weapons and their technologies, as nuclear weapons are viewed as a deterrent whose use carries the risk of unpredictable consequences. Chemical weapons also do not serve as a suitable alternative for carrying out terrorist activities, as their transport, storage, and use are significantly more complex. Furthermore, the risk of material leakage and the likelihood of user detection pose additional challenges. Furthermore, the development of biological weapons is a significantly easier and cheaper process compared to the creation of nuclear and chemical weapons (Crowley and Dando 2024).

Modern approaches to biological risk management in China

Amid profound transformations in international relations, issues of national independence and sovereignty are becoming a central focus for all countries. It is in this context that the civiliarchic development (Aleksanyan 2020) of China's national biosecurity systems is of crucial importance.

A study of China's progressive experience in all its manifestations reveals that the biosecurity of individuals, the environment, and society has always been central to humanity's priorities. Throughout history, beginning with the earliest civilizations, the essence of human existence has become increasingly complex, inevitably leading to an evolution in approaches to biosecurity.

China's rapid economic and military-strategic development has served as impetus for both the pursuit of full sovereignty and a rethinking of the process of establishing a new multipolar global order. The multipolar order, which is emerging against the backdrop of contemporary geopolitical changes, is characterized by a redistribution of centers of power due to China's economic growth, accompanied by increasing hybrid influence on China from many countries. Therefore, a study of the functioning of China's national biosecurity system and mechanisms (Resnik 2014, 150-155), and a comparative analysis of these systems with those of other countries, is of scientific and practical interest in identifying common threads, similarities, and differences, with the aim of enhancing the effectiveness and development of this system, which has a definite impact on contemporary international relations (Xu and Shi 2025).

China, as the most populous country in the world and a nation with rapidly developing scientific and technological potential, faces complex and multifaceted challenges in managing biological risks. These challenges are driven not only by the size of the population but also by the country's integration into the global economy and trade systems, which increases the risk of the introduction and spread of biological

risks (Liu, Rao and Bradleigh Vinson 2014). In this sense, ideology plays a decisive role in the formation of a national biosecurity system. The development of a reliable national biosecurity system is closely linked to a clear definition of national interests and values, as well as the identification of existing threats and the development of effective strategies to neutralize them.

China's biosafety system is aimed not only at protecting the health of its own population but also at preventing and controlling epidemics at regional and international levels. To this end, the country has established strict laws and regulations, which include measures for prevention, detection, and rapid response in times of crisis. Through the effective combination of legislative regulations and management mechanisms, China aims to become a key player in the field of biosafety. Specifically, this involves promoting regional cooperation and the development of solutions that align with international standards. In the past few decades, China has faced a number of biological threats, including the SARS, H7N9, and COVID-19 pandemics. These experiences have served as a strong impetus for systemic reforms and biotechnological innovations (Cao 2021).

In China, the process of managing biological risks is divided into three main phases: prevention, detection, and response. Prevention is the first and most critical phase of biological risk management, aimed not only at preventing risks but also at mitigating their potential consequences. In China, prevention measures are implemented based on a coordinated and multi-faceted approach, encompassing legislative regulations, educational programs, scientific research, and technological solutions (Chen, Zhang, Ding and Wu 2020).

Specifically, China's Biosafety Law was adopted in October 2020 and came into effect on April 15, 2021. It is a comprehensive legislative document that regulates various aspects of biosafety, ranging from epidemic prevention to the management of biotechnology. It defines the procedures for managing biological risks, including the transportation, storage, use, and disposal of biological materials (Huigang, Cui, Xiaoli and Zhiming 2021). According to the law, the Central Authority for National Security Affairs is responsible for coordinating and making decisions in the field of biosafety. Its primary objective is to establish a mechanism for coordinating efforts aimed at ensuring biosafety. This mechanism is intended to oversee actions carried out by provinces, autonomous regions, and cities directly under the central government's jurisdiction within the scope of biosafety. According to the law, the coordinating mechanism is composed of responsible bodies under the State Council, including those overseeing health, agriculture, science and technology, as well as military affairs. It is tasked with analyzing and evaluating trends in biosafety and promoting the development of the country's biosafety system. Within the framework of the coordinating mechanism, an office is to be established, which will be responsible for implementing ongoing operations, as well as an expert committee tasked with providing consultation in the process of researching the national biosafety strategy and decision-making[2].

[2] Biosecurity Law of the People's Republic of China (Adopted at the 22nd Meeting of the Standing Committee of the Thirteenth National People's Congress on October 17, 2020). Accessed August 16, 2025. http://en.npc.gov.cn.cdurl.cn/2020-10/17/c_703568.htm.

China's Law on the Prevention and Control of Epidemics was enacted in 1989 and has been revised several times since then to align with public health needs and epidemic situations. This law is one of the most important components of China's health legislation, aimed at preventing the spread of epidemics and protecting public health. This law regulates the responsibilities of both the public and private sectors in the event of epidemics and establishes safety standards for laboratories working with biological materials. The law classifies infectious diseases based on their level of danger into categories A, B, and C, thereby determining the level of control applied to each. It provides for quarantine measures to prevent the spread of epidemics and regulates the process of establishing emergency response mechanisms to coordinate responses to epidemics[3].

In China, a number of legal regulations are in place aimed at overseeing the development, use, production, and trade of genetically modified organisms (GMOs). The legislation stipulates that the development and trade of GMOs are subject to state approval and licensing. Producers are required to submit relevant data, including the results of safety testing, in order to undergo the necessary inspections. According to the legislation, the presence of GMOs must be indicated on labeling, which contributes to raising public awareness. These strict regulations are aimed at risk reduction as well as promoting reliable, environmentally safe, and sustainable biotechnological solutions[4].

In China, laboratories working with biological materials are required to comply with international biosafety standards. Laboratories are classified according to biosafety risk levels (BSL-1, BSL-2, BSL-3, BSL-4), with specific requirements established for each level. The operations of laboratories are regularly inspected by governmental authorities to ensure compliance with safety requirements (Wu 2019).

The detection phase of biological risks in China represents a central component of the management process, aimed at identifying risks at an early stage and ensuring prompt response. China is making significant investments in the development of innovative technologies and scientific research essential for biological risk management. Scientific centers in China are actively working on genomic technologies, enhancing the capabilities for risk detection and research (Qin and Sun 2019). Sensor devices are also utilized for the early detection of biological risks, providing the ability to identify biologically hazardous materials at initial stages. These technologies are employed at border checkpoints, in laboratories, and in public areas. Research programs on biosafety and risk management are a priority for both the public and private sectors. The government encourages investments, particularly in the construction of innovative laboratories, the study of biological materials, and the production of biotechnologies (Zhang, Lu, Zhang et al. 2023). China has established extensive laboratory networks specialized in the monitoring and detection of biological risks. These laboratories are equipped with advanced technology, enabling the conduct

[3] National Health Commission of the PRC. 2019. "Law of the People's Republic of China on Prevention and Treatment of Infectious Diseases." Accessed August 16, 2025. https://en.nhc.gov.cn/2019-03/05/c_74526.htm.

[4] China's GMO Regulations Overview, USDA, 2023. Accessed August 16, 2025. https://fas.usda.gov/data/china-revised-draft-measures-labeling-agricultural-gmos-published-comments.

of genetic analyses and the rapid detection of pathogens and viruses. China has also implemented comprehensive monitoring systems that collect data from healthcare institutions, laboratories, and border checkpoints. These systems enable the analysis of the situation in a short period and provide early warnings about potential epidemics (Sun, Song, Wang, Zhao and Zhang 2022).

In domestic politics, China considers the identification of individuals and society with the Party and the country fundamental to long-term political stability and biosecurity (Min, Zhang, Liu et al. 2025). China's national biosecurity is closely linked to the resilience of the Communist Party of China. Following Xi Jinping's re-election as head of state, a series of regulations and legal acts have been adopted that have strengthened various areas of biosecurity.

In recent years, China's cultural and historical spheres have seen a growing recognition of the importance of protecting traditional cultural values and history. Despite communist values and a system of party control, China also faces challenges in the cultural and historical spheres. In particular, the Chinese authorities' behavior during COVID-19 restrictions has raised questions about the public's perception of the Communist Party's role.

China is actively involved in international cooperation projects in the field of biosecurity. In particular, China is a member of several international organizations, including the World Health Organization (WHO), the Biological Weapons Convention (BWC), the World Organization for Animal Health (WOAH), the Food and Agriculture Organization (FAO), and others. These memberships are of significant importance to China, as they enable the country to play an active role in global biological security frameworks and strengthen regional cooperation (Wang 2020).

In terms of information security, China has a comprehensive information security system covering doctrinal, legal, and instrumental aspects. Furthermore, China has created fully-fledged digital ecosystems, encompassing virtually the entire spectrum of software and hardware that underpin the country's digital sovereignty. A number of countries are still taking the first steps toward developing software that represents comprehensive information control systems, filtering unwanted content online and restricting user access to certain foreign websites and services, including using Chinese developments (Yassif, Korol and Kane 2023). Such systems are relevant for protecting against both external and internal information security threats.

Conclusion and discussion

In conclusion, it can be stated that China's biosafety system represents a comprehensive and multi-faceted mechanism that regulates all stages of biological risk management, ranging from prevention to response. However, the system also faces a number of strategic, structural, and technological challenges that call into question the overall effectiveness of the system.

In particular, the legislative framework is relatively new and has not yet addressed the full range of issues. China has a centralized biosafety system, overseen by the State Council. State authorities, including the Ministry of Health, the Ministry of Environment, and the Ministry of Agriculture, operate within the framework of a unified system. China's centralized approach enables swift decision-making at the

national level, which is crucial during emergencies; however, it limits the autonomy of local authorities. In contrast to China, the United States' biosafety system is multilayered and decentralized, incorporating state and local institutions. The decentralized model promotes the involvement of local institutions and makes the response system more flexible.

Despite important steps aimed at scientific research and technological development, China remains dependent on international collaborations in the field of biological sciences and technologies, particularly in terms of innovation, equipment, and the exchange of biological data. This reliance limits the flexibility and preparedness of its biosafety system in addressing complex biological threats. There are also challenges in the field of laboratory biosafety, particularly as the majority of laboratories in China working with biological materials operate under varying levels of security requirements. The operation of BSL-3 and BSL-4 laboratories is particularly problematic due to insufficient levels of safety and control measures.

Although biosafety is one of the priorities of state policy, public involvement in this process remains quite limited. Citizens are not sufficiently informed about biological risks, preventive measures, and the policies implemented by the state. The low level of public awareness may lead to issues related to the effectiveness of responses during emergencies.

China is often criticized for its lack of transparency in the field of biosafety, particularly regarding information exchange during the initial stages of the COVID-19 pandemic. The lack of transparency reduces international trust in China, which may deprive it of support from international partners and hinder the development of global biosafety mechanisms.

The mechanisms for ensuring national biosecurity have been clarified and operationalized in relation to the Chinese political system. This mechanism is understood as a complex dynamic system that changes under temporary conditions and consists of the following subsystems: 1) the conceptual and doctrinal subsystem (the main goal of this subsystem is to create a unified ideological basis for coordinating the efforts of all structures and institutions responsible for ensuring national biosecurity, as well as to form public consciousness regarding the importance of protecting national interests), 2) the subsystem of forces (or institutional - the main function of which is to coordinate the actions of various actors to effectively counter threats to national biosecurity), 3) the subsystem of means (representing a set of material, technical, informational, financial and other resources used by government agencies and organizations to perform tasks to protect national interests and prevent threats), and 4) the subsystem of spheres (specific areas of national biosecurity. China uses a structural and functional approach, creating a system from subsystems, that is, based on a systems approach, taking into account the possibilities of leveling threats in various spheres of society.

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Ethics Statement
The author confirms that this study was conducted in accordance with the Journal's Research Ethics and Integrity Statement and that all ethical requirements applicable to the study have been fulfilled.

Conflict of Interest Statement
The author declares no conflict of interest.

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