THE INCREASING RISKS OF BIOLOGICAL WEAPONS AND THEIR IMPACT IN THE BLACK SEA REGION

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Abstract. Biological warfare is the deliberate use of microorganisms and toxins, which may be of viral, bacterial, plant, or animal origin, capable of causing infection and mortality in humans and livestock, as well as affecting agricultural crops. The use of biological weapons in terrorist attacks is driven by the easy accessibility of a wide range of disease-causing biological agents, their low production costs, the inability of routine security systems to detect them, and the ease of transporting them from one place to another. In addition, new and accessible technologies contribute to the proliferation of such weapons, which impact regional and global security. To combat such threats and to preserve culture and peace, it is necessary to focus on biological security and develop preventive and protective strategies through international consultations and cooperation.

The article examines the essence of biological weapons and the international treaties that regulate the policy of their non-proliferation. Significant attention is also devoted to the threat posed by biological weapons and their impact on international security. The study further discusses the effects of pandemics on the countries of the Black Sea region, using COVID-19 as an example, as well as the 2022 monkeypox outbreak and its potential impact on the nations within the Black Sea basin. The spread of this virus, which still has an epidemic character, serves as a reminder that smaller outbreaks of infectious diseases remain a constant companion of humanity. The aim of the article is to explore the role of biological security in contemporary geopolitics, the threats posed by biological weapons, and their implications for the Black Sea countries—challenges that may continue to place global politics and international relations in a state of uncertainty. The research employs a historical-descriptive method, policy analysis, and content analysis. The theoretical framework is based on realism theory, biological security theory, and securitization theory.

Key words: Pandemic, Biological weapons, Black Sea Region, International security, Asymmetric threats.

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Introduction. In the 21st century, as the process of shaping the world order unfolds and states face new realities, they are compelled to adapt to a changing environment. The scale of threats is growing globally, originating both from states and non-state aggressive actors, while global security is also challenged by dangers arising from natural processes. The issue of biological security and the formation of a new world order are highly relevant topics that require thorough research and analysis in the context of security, or securitization. Reducing chemical, biological, radiological, and nuclear (CBRN) risks and threats is among the most important priorities for states worldwide.

When discussing biological security, it is important to understand its factors, influence, and consequences. Biological security refers to the system of organizational, medical-biological, and engineering-technological measures and means aimed at protecting personnel, the population, and the environment from the effects of pathogenic biological agents.

In terms of threat scale, among the three main types of weapons of mass destruction, the biological variety surpasses not only chemical weapons but even nuclear ones. This is because, in the event of a global nuclear war, humanity might still survive, whereas pandemics caused by the use of biological weapons could lead to the near-total extermination of the Earth's population. This is precisely the central research problem of the present study (Sauer, 2020).

In the 21st century, as the global security system undergoes profound transformation and states face new, complex challenges, the issue of biological security acquires particular significance. Biological agents, as weapons of mass destruction, possess distinctive characteristics and a high threat potential, defined by their speed of dissemination, lethality, and effectiveness. In the modern international context, biological threats have become increasingly connected not only to interstate relations but also to irregular actors and transnational challenges in the security sphere, such as bioterrorism and organized crime (Koblentz, 2014).

The implementation of a biological security system requires a broad, integrated approach that includes epidemiological monitoring, timely and effective response, and strengthened international cooperation. Most importantly, biological security encompasses both public health protection measures and national security strategies, which at present are often interconnected and not distinctly separated (Fidler & Gostin, 2006). The growth of biological threats and the natural-technological synthesis of their causes further reinforce the necessity for states and the international community to enhance prevention, research, and crisis management mechanisms.

The new era of global security requires not only the recognition of traditional military threats but also the comprehensive protection of health and the environment. Therefore, improving biological security must be one of the highest priorities at both regional and international levels in order to prevent catastrophic pandemics in the future and mitigate their severe social and economic consequences.

Historical Instances of Biological Weapon Use

It is believed that the first confirmed use of biological weapons dates back to 1346, when Janibek of the Golden Horde reportedly threw the corpse of a soldier who had died of the plague into the besieged fortress of Caffa (present-day Feodosia region, Crimea). Although the plague forced the defenders of the fortress to surrender, fleeing merchants carried the epidemic of the Black Death across Europe (Wheelis, 2002).

In 1763, during the period of the Golden Horde—allegedly with a more "democratic" approach—the British military reportedly sent blankets infected with smallpox to Native Americans who had besieged a British fort (Spyrou et al. 2022).

During the Second World War, Japan conducted experiments to develop biological weapons, deploying samples in Mongolia and China during military operations.

From the 1930s, the Soviet Union secretly conducted research to develop biological weapons, and during the war, Stalin's directives even included bombs containing the causative agent of anthrax. However, under Beria's supervision, biological weapons were reportedly used only once: in the summer of 1942, when the Soviet army faced severe difficulties near Stalingrad, they released field mice infected with tularemia onto German positions. This action temporarily halted the German advance, as the number of German soldiers infected with tularemia sharply increased in that particular sector of the front. Nevertheless, it soon became evident that the Russian field mice, sent under Beria's "orders," lacked patriotic loyalty; the mice crossed to the other side of the front and infiltrated Soviet trenches and command posts as well.

A major incident of anthrax dissemination among civilians, resulting in lethal consequences, occurred in 1979 in the Soviet city of Sverdlovsk (present-day Ekaterinburg). Due to technical malfunctions at a classified military facility, where anthrax spores were being studied for combat purposes, these dangerous bacteria were released into the atmosphere, resulting in the deaths of 64 inhabitants of the city (Aladashvili, 2022).

During the Cold War, research and development of biological weapons continued intensively in both the Eastern and Western blocs. In 1943, the United States initiated a large-scale biological weapons program, involving several thousand scientists and military personnel. However, in 1969, President Richard Nixon officially announced the termination of all research and production of biological weapons, and the country subsequently acceded to the Biological and Toxin Weapons Convention (BTWC).

More recently, it is worth recalling that in 2001, a series of biological attacks using anthrax in the United States once again raised questions regarding the effectiveness of biological weapons control (Atlas, 2002). Spores sent through the postal system resulted in the deaths of five individuals and caused injury to dozens more, clearly demonstrating that biological weapons can be employed not only by states but also by individuals or terrorist groups. This incident further underscores the contemporary threats posed by biological weapons and the urgent need for stringent international regulation.

Types of Biological Weapons

Certain pathogenic microorganisms, viruses, and bacterial toxins can be employed as weapons of mass destruction. These include agents that are potentially lethal to humans, such as *Bacillus anthracis* (anthrax), *Shigella* species (dysentery), *Yersinia pestis* (plague), as well as agents causing temporary incapacitation, such as *Vibrio cholerae* (cholera), *Brucella* species (brucellosis), *Corynebacterium diphtheriae* (diphtheria), *Francisella tularensis* (tularemia), among others.

Entomological weapons can be classified into three types. The first type involves insects deliberately infected with a pathogenic agent, which are then dispersed over enemy positions using artillery shells or aerial bombs. These insects bite humans and animals, thereby accelerating the spread of epidemics. The second type consists of releasing insects—potentially not pre-infected—in large numbers over enemy positions agricultural lands to destroy crops and livestock. The third type involves the dispersal of large numbers of bees or wasps over enemy trenches, where painful stings, particularly to the eyes, can temporarily incapacitate opposing soldiers and reduce their combat effectiveness.

The use of entomological agents as a form of biological weapon is relatively under-researched, yet it poses a significant threat. Historically, experiments conducted by Japan during World War II, notably the infamous "Unit 731," involved infecting ants, flies, and lice with pathogens such as plague and cholera, and deliberately deploying them over enemy territory (Harris, 2002). Such methods effectively accelerate the spread of infections and complicate epidemiological control. Moreover, the deployment of non-infected insects for agricultural destruction or as a means of psychological pressure constitutes a form of biological sabotage, which is often difficult to substantiate in international tribunals (Lockwood, 2012). This type of weapon is particularly problematic due to the considerable time and resources required for its detection and identification.

Methods of Biological Weapon Deployment-Any type of weapon requires transportation over a certain distance in order to bring it into proximity with the intended target. Biological weapons are no exception. The methods of deploying biological weapons are diverse and often difficult to identify. Beyond traditional delivery mechanisms—such as aerial vehicles and artillery shells—significant risks are associated with small, hard-to-detect channels, for instance, the incorporation of the agent into mail, drinking water, or food (Leitenberg, 2001). One notable incident occurred in 2013, when letters containing ricin—a proteinaceous toxin of plant origin that is extremely toxic even in small doses—were sent via mail to high-ranking U.S. officials (Franz et al., 2011). This case clearly demonstrates that biological weapons can be used in a targeted manner, beyond national borders, significantly complicating detection and prevention efforts. At the same

time, the inconspicuous nature of biological agents renders them particularly hazardous for modern security systems.

Why Biological Weapons Are Particularly Dangerous-Biological weapons are especially hazardous due to the characteristics of the viral and bacterial strains used. These agents often have an incubation period during which infected individuals show no visible or olfactory signs, and they cannot be detected by taste. This makes it extremely difficult to promptly identify the use of such weapons of mass destruction by an adversary. Specialized laboratory analyses are required for confirmation. One potential indicator of biological weapon deployment may be the discovery of specific bombs or shell fragments through which the agent was dispersed (United Nations Office for Disarmament Affairs. 2020).

A sudden increase in the number of rodents or insects in a combat zone, or even deep within rear areas—particularly the appearance of fleas in winter—should also raise suspicion. To enhance the combat effectiveness of a biological weapon, it may contain various viruses or bacterial spores. However, its developpers usually take precautions, employing strains that are not transmissible from human to human, thereby protecting their own troops from unintended infection.

Production and Use of Biological Weapons

The prohibition of biological weapons remains one of the most pressing challenges in international law. The Biological and Toxin Weapons Convention (BTWC), adopted in 1972, legally prohibits states from developing, stockpiling, or using such weapons (United Nations Office for Disarmament Affairs (United Nations Office for Disarmament Affairs. 2020). However, a significant shortcoming of the Convention lies in the absence of enforcement mechanisms—unlike the Chemical Weapons Convention, the BTWC lacks verification systems, which creates opportunities for the implementation of clandestine state programs.

The example of the Soviet Union provides a striking illustration of this issue: in 1973, merely one year after signing the BTWC, Moscow established the highly classified research complex “Biopreparat,” which, for decades, maintained and produced pathogens—including the Ebola virus, *Yersinia pestis* (the causative agent of plague), and other agents (Alibek & Handelman, 1999). Such practices cast doubt on the effectiveness of international agreements and demonstrate that political will and signatures alone are insufficient to prevent biological threats.

Despite the international prohibition of biological weapons, their control remains a global security challenge. Many states lack full transparency in their biological research programs, complicating the distinction between peaceful and military purposes. Monitoring so-called “dual-use” technologies is particularly difficult—for example, laboratory research that may simultaneously serve scientific and biological weapons development purposes (Koblentz, 2010). Moreover, several significant states, including Israel, have not acceded to the Convention, further complicating the attainment of a global agreement.

The threats associated with the development of biological weapons are becoming increasingly salient in the context of modern biotechnology, where genetic engineering and synthetic biology could be used to create novel pathogens that do not naturally exist (Selgelid, 2007). This raises the critical question of whether the BTWC should be strengthened with new, binding verification mechanisms.

The Impact of COVID-19 on Black Sea Regional Security

SARS-CoV-2, the etiological agent of COVID-19, was first identified in December 2019 in Wuhan, China, and rapidly evolved into a global pandemic. The precise origin of the virus remains a contentious and highly debated issue within the international scientific and policy communities. Leading researchers have proposed two principal hypotheses: the natural zoonotic spillover theory and the laboratory leak hypothesis.

The zoonotic spillover hypothesis is supported by the historical epidemiology of coronaviruses. Both SARS-CoV and MERS-CoV originated in bats and subsequently crossed to humans via intermediate hosts, such as civets and camels. The genome of SARS-CoV-2 shares 96% sequence identity with the bat coronavirus RaTG13, which strongly indicates a natural origin (Zhou et al., 2020). Furthermore, the virus's high binding affinity to the ACE2 receptor aligns with natural evolutionary processes and is less consistent with a genetically engineered profile (Andersen et al., 2020).

The second hypothesis concerns the possibility that SARS-CoV-2 originated from the Wuhan Institute of Virology. Proponents of this theory note that the Institute was conducting research on bat-derived coronaviruses. However, to date, no evidence has been identified that confirms the creation of a genetically engineered virus or a laboratory leak. The World Health Organization's 2021 report similarly assessed a laboratory origin as "extremely unlikely, although it cannot be entirely ruled out" (World Health Organization, 2021).

Ultimately, establishing the precise mechanism of COVID-19's emergence requires open, transparent, and internationally coordinated multidisciplinary research. This process necessitates not only rigorous analysis of scientific data but also the implementation of high biosecurity standards to mitigate the risk of future pandemic events.

The COVID-19 pandemic has significantly transformed the paradigm of global security, demonstrating that contemporary threats are not solely of a military nature and that biological hazards can precipitate widespread instability. The pandemic undermined healthcare systems, economies, and state governance structures. In numerous countries, the functioning of critical infrastructure was disrupted, directly impacting social order and national security (Koblentz, 2020).

The global shock particularly affected food supply chains, medical resources, and logistics. Additionally, political tensions escalated on the international stage—for instance, through the geopolitics of vaccine distribution or accusations regarding the virus's origin. The pandemic also raised pressing issues of biosecurity and bioethics, highlighting the vulnerabilities of states and underscoring the necessity for close coordination between scientific and security institutions (World Health Organization. 2020).

The COVID-19 pandemic has significantly altered the security architecture of the Black Sea region, which was already characterized by a complex geopolitical landscape. At the onset of the pandemic, the region was experiencing multiple diplomatic crises and military tensions. Notably, the military involvement of Turkey and Russia in Syria stood out, where, despite a long history of cooperation, the two countries remained in opposing positions. Additionally, Russia's annexation of Crimea and the continuation of military operations in eastern Ukraine further exacerbated tensions with NATO members—Turkey, Bulgaria, and Romania (The source of the Black Death in fourteenth-century central Eurasia, 2022).

From the very beginning of the pandemic, Romania faced particular challenges, emerging as one of the most vulnerable members of both the European Union and NATO. This situation was linked to two main factors: the country's weakly managed healthcare system and the significant diaspora closely connected to the pandemic epicenters in Italy and Spain.

In Turkey, COVID-19 also exacerbated social and political risks. By April 2020, the country had already recorded over 13,000 confirmed cases while simultaneously hosting the world's largest refugee population—approximately 4.1 million. The concentration of refugees, combined with economic challenges and weak public services, significantly hindered the country's capacity to combat the virus effectively (Crisis Group. 2020).

In Georgia, the initial phase of the pandemic saw relatively low infection levels. Nevertheless, the government promptly implemented preventive measures, including border closures and the suspension of

air travel to high-risk countries. Despite this effective management, the country's economy—which relies heavily on the tourism sector—suffered substantial negative impacts.

The situation was particularly difficult in the Russian-occupied regions of Abkhazia and South Ossetia, where local healthcare systems were ill-prepared to manage a prolonged pandemic. Due to their unrecognized status and isolation, access to international assistance was severely limited. The Georgian government's efforts to support medical services, including the activation of the Rukhi Clinic, represented a significant step. Nevertheless, the prevailing political situation continued to hinder a comprehensive humanitarian response.

The conflict in eastern Ukraine is, in many respects, comparable to the hybrid challenges present in South Ossetia and Abkhazia. In both cases, territorial separatism is supported either directly or indirectly by a neighboring state—Russia—violating fundamental principles of international law. Such conflicts are difficult to address through standard diplomatic or military solutions, as they are rooted not only in internal political disputes but also in deeply entrenched geopolitical interests (De Waal, 2020).

Against the backdrop of the COVID-19 pandemic and subsequent developments, the dynamics of the conflict in eastern Ukraine became even more complicated. Although the global health crisis forced many states to reconsider priorities and reduce military activity, the opposite trend could not be ruled out in the Donbas region. According to one possible scenario, the pre-pandemic instability of the ceasefire regime could have escalated into intensified combat along the contact line, prompting both sides to expand and consolidate their positions until the spread of infection hindered logistical and mobilization capacities.

Armed conflicts such as the Russia–Ukraine war significantly amplify pandemic-related risks, especially considering verified reports that Russia has employed biological weapons against Ukraine. Consequently, controlling the spread and potential further mutation of pathogens becomes extremely challenging, as managing viral outbreaks in active combat zones is highly complex. Taking all this into account, the international community must adopt stricter measures to prevent and prohibit the use of biological weapons by Russia.

The pandemic introduced a new, multidisciplinary perspective on international conflicts, in which health, security, and human rights are closely interconnected. A different scenario was also possible—delays in military operations if the conflict parties—Kyiv, Moscow, and local separatist authorities—had prioritized the welfare of the population and the control of infection. Nevertheless, civilian and military personnel residing in eastern Ukraine remained the most vulnerable group in the Black Sea region (United Nations Office for the Coordination of Humanitarian Affairs (OCHA). 2021).

In this context, the role of the international community became even more salient. It was essential for the West—as a defender of international law and humanitarian values—to consistently emphasize Moscow's responsibility, not only for the annexation of Crimea and the de facto occupation of the Donbas region but also for the health and welfare of the population living there. Neglecting humanitarian obligations during the pandemic must necessarily constitute a basis for both legal and ethical accountability.

The Black Sea region has historically been the epicenter of numerous crises; however, COVID-19 created an unprecedented test that, in the medium term, may shape the region's strategic character even more than any military or political conflict. The economic recession triggered by the pandemic, the strain on healthcare systems, and the deepening of social divisions all contribute to regional instability and potential radicalization. Accordingly, the resilience of the Black Sea region will be assessed not only by its military capabilities but also by its "immune system"—both literally, in terms of public health, and metaphorically, in terms of institutional robustness and the capacity for international cooperation (Burkle, 2020).

Regarding monkeypox and its global spread, including in Black Sea countries, the situation as of the second quarter of 2024 is not particularly encouraging from a statistical standpoint. What had previously

persisted primarily in Southern African countries prompted the World Health Organization (WHO) to declare the virus a “Public Health Emergency of International Concern,” emphasizing that monkeypox “is not a new COVID infection.” This marks the second emergency alert issued by the global health agency concerning this virus within the past two years.

Monkeypox was first identified in Africa in 2022, initially in the Democratic Republic of the Congo (DRC). The current epidemic is primarily driven by the Clade 1 strain, considered a more severe variant that can be transmitted through skin-to-skin contact. In 2023, a new Clade 1 strain—Clade 1b—was identified in the DRC. Additionally, there have been sporadic outbreaks of the earlier Clade 2 strain, although at a lower level. In July, more than 100 countries reported confirmed cases of the virus. The highest proportional incidence was recorded in the Democratic Republic of the Congo, where, in December 2022, the Congolese authorities declared a monkeypox epidemic.

Outside African countries, the virus has spread to Asia at low percentages, with isolated cases reported in countries such as Pakistan, the Philippines, and Thailand, while the mortality rate remains zero. Regarding Europe and the Black Sea region, one case of monkeypox was confirmed in Sweden on August 15 of this year, caused by the Clade 1 strain. According to the European Centre for Disease Prevention and Control, it is expected that Europe may record more Clade 1 cases due to frequent air travel between Europe and Africa. However, the spread in Europe may remain low if cases are detected quickly and if testing, surveillance, and contact tracing are carried out promptly. At this stage, the European Union has ruled out closing borders to countries where the virus persists. Since Black Sea countries—particularly Turkey—maintain intensive air connections with African nations, there is a basis to anticipate that monkeypox could soon appear in this region as well, potentially causing serious economic disruption and a crisis in healthcare capacity. Although the World Health Organization currently rejects the classification of the epidemic as a pandemic, it is not yet possible to state this with certainty.

As an unconventional, non-kinetic weapon of mass destruction, biological weapons can inflict devastation comparable to that of a pandemic. Similar to a pandemic, if a biological attack spreads widely, healthcare systems may become overwhelmed, leading to social panic, a reduction in healthcare personnel, economic collapse, depletion of human resources, and—most critically—a threat to life on Earth. This cycle will only change when the pathogen weakens or natural immunity strengthens.

Conclusion. The COVID-19 pandemic represented a pivotal event that fundamentally reshaped international security priorities. The reliance on traditional defense-oriented approaches, rather than disease control measures, proved ineffective—underscoring the critical necessity for harmonized collaboration among healthcare systems, the scientific community, and governing institutions (Burkle, 2020). The vulnerability of states in the face of viral threats clearly indicates that biological security must be regarded not merely as a matter of public health but as an integral component of both national and international security strategies.

At the global level, the pandemic has markedly exacerbated social and economic inequalities, inherently generating potential for political discontent and increasing the risk of radicalization and conflict. Economic crises and disruptions in food supply chains have, in certain regions, precipitated population displacement, social protests, and violent confrontations. Concurrently, states have reinforced border controls and curtailed international cooperation, thereby posing additional threats to mechanisms of collective security.

The pandemic also exposed vulnerabilities in information security—misinformation, conspiracy theories, and false medical recommendations inflicted significant harm on public health and complicated crisis management (World Health Organization, 2020). Consequently, it became evident that preparedness for future pandemics requires not only the availability of vaccines but also integrated response systems grounded in international standards.

Regarding international security, COVID-19 underscores that biological threats are no longer hypothetical; they constitute a tangible challenge demanding a transdisciplinary, rapid, and coordinated response.

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