Forum: World Health Organization (WHO)

Issue: Ensuring Biosecurity Amid the Convergence of Artificial Intelligence and Genetic Editing Technologies

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Introduction

While artificial intelligence becomes ever more sophisticated, as does genetic editing via methods including Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR), the possibilities these technologies create for medicine, agriculture, and research are all new. The combination of genetic editing and artificial intelligence raises concerns about biosecurity because it may hasten the emergence of harmful pathogens. With this, the capability to edit genes with precision and application of AI to large genetic information, there indeed come colossal possibilities and risks: inadvertently creating hazardous organisms, bioengineering for nefarious purposes, or misuse of sensitive genetic information.

Definition of Key Terms

Convergence

When two or more things combine to create a new whole

Biosecurity

Describes precautions taken to stop the entry or spread of dangerous viruses.

Biological Systems

Complicated web that links a number of biologically significant entities

Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)

Segment of DNA containing short repetitions of base sequences.

Nuclear Threat Initiative (NTI)

Nonprofit organization focused on reducing biological, chemical, and radiological threats

Genetic Editing

A collection of technologies that enable scientists to modify an organism's DNA.

Background Information

Such AI technologies integrated with genetic editing technologies like CRISPR would have huge consequences for leaps and bounds in medicine, agriculture, and environmental sciences. The applications may include accelerating research or allowing more precise genetic modifications. It also exacerbates the biosecurity risks, which include the design of maliciously synthetic viruses using AI, enhancement of virulence of a pathogen, and design of harmful biological agents. However, there is a catch herein: the very efficiency and speed at which it throws up its insights might give way to more unpredictable results or misuses, such as bioterrorism or accidental release of genetically modified organisms. Appropriate biosecurity measures should therefore be undertaken in the context of risk management to safely gain from those promising technologies. That is why international cooperation has been urged and why ethical guidelines on the use of AI and editing of genetic material are supported by organizations like the WHO to minimize harms and maximize positive societal consequences.

Major Parties Involved

United states

- In 2021, the Biden administration announced a National Biosecurity Strategy to ensure that the United States was fully ready to deal with biosecurity risks, including those presented by AI and biotechnologies. The strategy outlined ways of enhancing biological risk management systems and improving governance of biotechnology advancements, especially in response to biosecurity risks touching on biological weapons, pandemics, and other threats;
- In the US the National Security Commission (NSC) on Artificial Intelligence was created by Congress to provide recommendations on the national security implications of AI, including how the technology might be used in biotechnologies relevant to biosecurity. The commission provides recommendations to leverage AI safety without its misuse, specifically in military and national defense applications, including biosecurity concerns.

China

- The position that China occupies in the biosecurity arena, at a time when AI and genetic editing technologies are converging, is an extremely complex combination of proactive measures, strategic investments, and regulatory efforts all rolled into one. China heavily invests in the advancement of both, yet at the same time, it is fully able to recognize the possible biosecurity risks arising from the misuse of the same technologies;
- Moreover, to avoid these risks, it has adopted several measures: the regulation of AI applications such as recommendation algorithms and deep fakes, and a call for international cooperation in developing safe AI. For instance, China issued the "Global

AI Governance Initiative" to advance safe and reliable AI technologies and participated in the UK's AI Safety Summit;

- Starting in 2020, the National Biosecurity Law of China showed the efforts put into biosecurity measures. The framework is set to ensure that research can be undertaken safely, with regulation and national security concerning emerging risks no less than bioengineering and biological threats, with the use of technologies including artificial intelligence and genetic engineering. Mainly, the law intends to protect public health, prevent biological hazards, and provide quite strong regulations over genetic engineering.

United Kingdom

- Among others, at the beginning of 2024, it was announced that the UK and the US had teamed up in an effort to enhance biosecurity through a Strategic Dialogue on Biological Security. This will be effected through improvements in surveillance, outbreak response tools, and responsible innovation in biotechnology. The agreement commits to the "One Health" approach, where under one roof, environmental, animal, and human health come together with the view to enhancing detection of biological threats and preventing them;
- The UK's strategy also invests in metagenomics projects to accelerate the detection of pathogens using genetic sequencing, hence helping to shave off response times in the case of infectious diseases. These investments are an indicator of how the UK, based on state-of-the-art technologies, is underlining efforts that will further strengthen national and global biosecurity frameworks.

Russia

- The position of Russia on biosecurity, at a moment when technologies of artificial intellect and genetic editing start to converge, is defined by strategic development and caution alike. Thus, Russia has invested seriously in biotechnology, notably through the Federal Research Programme for Genetic Technologies Development;
- While Russia is for biosecurity, a lot of questions have been raised on dual-use technologies for their possible military use, especially in the areas of defense strategies that could relate to AI and genetic editing. There are a number of concerns about the possibility of secretive research in genetic technologies for military purposes, which goes against international norms concerning biosecurity.

Timeline of Key Events

Date	Description of Event
2020	The integration of AI with the technology of genetic editing back in 2020 created a great setback due to colossal biosecurity issues. Although these technologies apparently possess the potential to revolutionize agriculture, medicine, and environmental protection, they do introduce biosecurity risks when misused.

2021	The intersection of genetic editing and AI in 2021 gave rise to some pretty serious biosecurity concerns, since both technologies carry huge risks along with the new opportunities. Because of recent advances in AI, inclusive of large language models and biodesign technologies in the life sciences, the competence for processing biological data and engineering living systems has continued improving. Some of these technologies have the great potential to improve the science of developing new vaccines and disease prevention on the one hand, while bringing in the potential for far-reaching misuse in creating bioweapons or other harmful biological agents on the other. It added, in conclusion, to the growing body of evidence that robust governance and regulatory frameworks are necessary to ensure these technologies cannot be used with malicious intent.

2022	The talks about biosecurity in the context of convergence between AI and genetic editing technologies gained considerable momentum in 2022, given the pace at which both those technologies are improving. Indeed, AI tools have great potential to completely revolutionize arenas like vaccine development and pandemic preparedness, in particular related to genetic design and biotechnological development.The concerns of their abuses, such as supervirus development and bioweapons, have called for more regulation and control urgently.
2023	It is also not easy on the institutional and government level, knowing how to regulate such developments: To deal with the risks of AI-bio capability, global governance frameworks have to be improved immediately. This would involve the strengthening of biosecurity screening tools, increased cooperation between developers of

	AI and biosecurity specialists, and the creation of global standards to prevent abuse.For instance, AI models already play a critical role in vaccine development and pandemic preparedness planning but need to be protected against applications in the design of new poisons or infectious agents.
2024	Speaking in 2024, it is ominous that the development of both genetic editing and artificial intelligence technologies will, in a not-so-distant future, crash head-on into a twin current of risk and transformative potential, where the maintenance of biosecurity remains one of the most resonant challenges of today. In such a manner, while these technologies continue to evolve, their dual-use nature bears within themselves trends of both opportunities and risks, most especially in regard to biosecurity. While AI and genetic editing technologies, including CRISPR, hold great promise for changing the

	landscape of research, medicine, and agriculture, their misuse would result in the generation of harmful pathogens or worsening biological warfare capabilities. Some of the biosecurity challenges arise by incorporating biotechnology with artificial intelligence.

Previous Attempts to Resolve this Issue

1. **Governance of Gene Editing**

   The WHO has been engaged in the provision of international frameworks for the governance of gene editing with respect to application to human health and observance of ethical standards. The WHO calls for international cooperation in matters of biosecurity in order not to create harmful biological agents with the facilitation of AI-assisted genetic editing;

2. **The International Scientific Collaboration**

   For example, the Global Forum on Biosecurity-brings scientists and policy makers together to establish global standards of biosecurity and the dissemination of best practices.

Possible Solutions to Resolve this Issue

1. Create a global "AI-Bio Forum" to create and disseminate AI model guidelines that lower biological dangers;
2. Create a completely new, more flexible strategy for national AI-bio capabilities governance;
3. Put promising guardrails for AI models into practice at scale. Adopt a bold research plan to investigate further AI safeguard alternatives;
4. Boost biosecurity measures at the point where digital design tools and biological systems meet;
5. Develop next-generation pandemic preparedness and response capabilities with AI tools.

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