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Editorial

Dual Nature of Biotechnological Innovation

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In the past, only nature could create pathogens. Through evolution, it demonstrated an impressive ability to produce a wide range of infectious agents. But now, thanks to advancements in biotechnology, humans can engineer new viruses and bacteria. Synthetic biology, in particular, offers exciting opportunities to better understand disease-causing agents and create new medical treatments and diagnostic tools. However, these advancements also bring the risk that some of the deadliest pathogens in history could be recreated without needing access to natural sources. Recombineering techniques are widely used in laboratories, but they do have some limitations. Recently, there have been many new genome-editing technologies emerging. One example is CRISPR, which has revolutionized the ability to edit the genetic code. This technology has a lot of potential in biomedical research and in studies where scientists manipulate the genomes of pathogens. This could help us understand how genes work in microbes better. However, it also makes it easier to create 'designer bugs' that might be more harmful or contagious than natural ones [1].

Examples such as the recreation of the Spanish flu virus and the synthesis of a synthetic horsepox virus underscore the potential risks associated with manipulating biological materials [2,3]. These endeavors highlight the dark side of biotechnological innovation, amplifying fears of accidental release or deliberate misuse with catastrophic consequences. Accessible online, the complete genetic blueprint of perilous viruses raises concerns about the potential for deliberate or accidental release, amplifying apprehensions surrounding biotechnological innovation [1]. The onset of the COVID-19 pandemic in late 2019 propelled the world into a whirlwind of illness and mortality, yet the true origin of the SARS-CoV-2 virus remains shrouded in uncertainty. Whether stemming from natural emergence or laboratory-related activities, the pandemic's source eludes definitive identification, echoing the need for rigorous biosafety measures and heightened surveillance [5].

While progress in synthetic biology will simplify the creation of treatments and technologies to protect us from pandemics, these advancements could also enable both governmental and non-governmental entities to develop more dangerous pathogens. Apart from establishing new global standards and practices, we must also adopt more adaptable measures to tackle the risk posed by bioengineered pathogens. One of the main challenges in responding to outbreaks, especially with new infectious diseases, is having reliable diagnostic tests that can quickly and accurately determine if someone is infected. As our abilities in biotechnology advance, so does the danger of engineered pathogens. An engineered pandemic may not announce itself with a massive explosion, but the suffering it causes to those affected will be just as real [4].

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