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TOPIC: Ethical Challenges of Synthetic Biology

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Ethical Challenges of Synthetic Biology; Recent Updates

Synthetic biology has been a practice used for decades, however its current market is on the rise. Synthetic biology is designed to find solutions in the fields of medicine, agriculture, and manufacturing. The rise of the focus and practice of synthetic biology has created new controversy posing ethical challenges.

The development of this practice has assisted researchers in their response to Covid-19. Scientists have used synthetic biology to create artificial enzymes to target the genetic code of SARS-CoV-2, or Covid-19. These enzymes are biological catalysts and their primary function is to carry out chemical transformations required for our bodies to function. Scientists have explored the area of XNA, which were synthetic chemical alternatives from RNA to DNA and considered the first fully-artificial enzyme. Also known as XNAzymes, their catalytic core is used against Covid-19 to cut their RNA sequence and attack mutated sequences¹. With this newly developed use of synthetic biology, scientists have found a possible solution to eradicate the virus while creating another approach to make a new generation of antiviral drugs.

In another field, synthetic biology is used for the creation of transforming bacterial cells into live artificial cells. Genetic material is placed in the bacterial cell as a plasmid: a short DNA molecule that is separate from the bacteria's "natural" genome². Scientists have found a way to program their genetic sequences as an artificial neural network. Although scientists compare it to

¹ "Synthetic Biology Meets Medicine: 'Programmable Molecular Scissors' Could Help Fight COVID-19 Infection." *ScienceDaily*, ScienceDaily, 16 Nov. 2022, <https://www.sciencedaily.com/releases/2022/11/221116085937.htm>.

² staff, Science X. "Transforming Bacterial Cells into Living Artificial Neural Circuits." *Phys.org*, Phys.org, 14 Nov. 2022, <https://phys.org/news/2022-11-bacterial-cells-artificial-neural-circuits.html>.

a technological computer, it carries out its biological process and acts as a switch through the absence or presence of a molecule. With this, they can modify molecules, activate, and suppress other genes. The advancements in synthetic biology have led to scientists being able to control this process which leads to genes that would create bacterial cells to perform complex tasks and assists in the development of artificial intelligence algorithms. Overall, the creation of these neural circuits have led to scientists making genetic modification at a much greater and more efficient rate.

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