Synthetic Biology: A New Field of Study with Potential Biotechnological Applications

Fleur Delacour
Editorial Manager, Allied Academies, London, United Kingdom

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Editorial Note

Biotechnology was created by combining essential fields such as chemistry, biology, computer science, engineering, mathematics, and physics. In addition, the emergence of a related new area, genetic engineering, catapulted biotechnology into the spotlight of science in society. The term "synthetic biology" was coined recently to describe the use of biotechnology developments in practical and advanced technologies.

Synthetic biology can thus be described as a tool for creating novel biological pathways, species, and devices that do not exist naturally, as well as for redesigning natural biological systems. This technology allows for unique solutions in a number of fields, including drug development, fine chemicals, sustainable biofuels, vaccines, value-added materials, protein therapeutics, and so on. Synthetic biology, as a multidisciplinary field, offers numerous scientific and technological opportunities in areas such as food, medicine, agriculture, bioremediation, and electricity.

The processing of food ingredients using synthetic biology-derived engineered microorganisms demonstrates the technique's viability in the food industry. The use of *Corynebacterium glutamicum* as a possible model organism for amino acid development, and the biosynthesis of resveratrol by a genetically engineered Saccharomyces cerevisiae Synthetic biology functional applications include the use of non-conventional yeasts such as *Hansenula polymorpha, Kluyveromyces lactis*, *Pichia pastoris,* and *Yarrowia lipolytica* in the production of essential bioproducts (biorenewable chemicals, food additives, therapeutic proteins, and vaccines).

The application of synthetic biology in the fields of agriculture and bioremediation has several intriguing goals. This technology could be used to enrich soil with genetically modified microorganisms for a particular crop or to grow genetically modified strains capable of cleaning up soil contaminated with toxic chemicals.

The difficulty in completely breaking down the lignocellulose in plant cell walls is the key problem to be resolved in the biofuel sector. As a result, synthetic biology is being investigated in order to minimise cell wall resistance by developing and prospecting unique enzymes to turn non-food biomass into fuel. Given recent scientific advances, clinical applications of synthetic biology may be the most prominent. The development of the clustered regularly interspaced short palindromic repeats (CRISPR)/CRISPR-associated (Cas) systems has made it easier to model, design, and install synthetic gene circuits and other biomolecular components, as well as to rewire and reprogram species for various purposes.

The Brazilian startup GPhantom, founded by chemist Michele Ferreira da Costa and medical doctor Felipe Wilker, is another notable example of ground-breaking technology involving synthetic biology and clinical application. The company creates a substance that looks and feels like human tissue, as well as breast and arm simulators that simulate interactions like cysts and venous connections inside the body. The mimetizer can be used to calibrate ultrasound machines as well as during the creation of techniques that involve a tissue simulation prior to human testing.

Synthetic biology has been dubbed the most ground-breaking interdisciplinary science of the twenty-first century, with many promising technologies that have the potential to change the planet. Synthetic biology, on the other hand, poses ethical concerns that necessitate further discussion of the technology's biosecurity.

***Correspondence to:**
Fleur Delacour
Editorial Manager,
Allied Academies,
London, United Kingdom.
E-mail: editor@alliedacademies.org