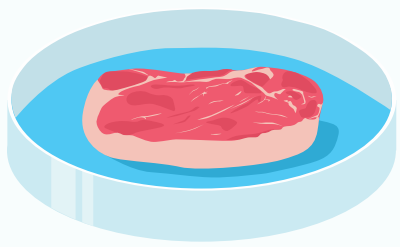
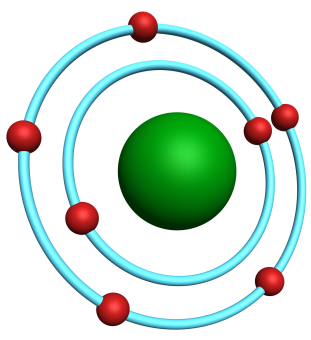
Top 6 Ways Synthetic Biology is Changing the World

Synthetic biology aims to redesign biological components and systems that do not naturally exist. Some of the goals of synthetic biology are the design of standardized biological parts, applied protein design, natural product synthesis, and synthetic genomics. A major advancement in synthetic biology is the gene-editing technology CRISPR (clustered regularly interspaced short palindromic repeats). CRISPR holds the promise to push synthetic biology to groundbreaking applications. Here are 5 areas where synthetic biology can change the world.

1. Manufacturing of Food Products

Livestock production is the largest producer of greenhouse gases, consumer of antibiotics, user of land, and source of environmental waste on the planet. Synthetic biology offers the ability to produce clean meat, which involves growing animal cells in bioreactors to produce animal meat. Synthetic biology also offers the ability to make plant-based food, for meat alternative products, through its ability to synthesize heme, a component responsible for meat color and flavor. This promotion of meat alternative products will result in a significant reduction in energy requirements, antibiotic consumption, and greenhouse gas emissions.





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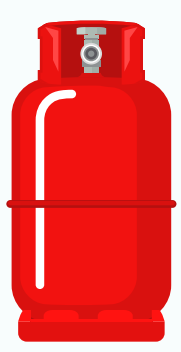
2. Extracting Nitrogen from the Soil

Synthetic nitrogen fertilizers are often used as a source of nitrogen to encourage plant growth, but they have their drawbacks in that they contribute to water pollution and prevent soil microbes from naturally producing nitrogen. One option is to extract the nitrogen in the soil from nitrogen-fixing microbes thus lessening reliance on nitrogen fertilizers. By utilizing the power of biology, machine learning, and computational modeling, these microbes can get fine-tuned by the introduction of genetic variations to optimize the release of the nitrogen into the roots of the plants.

3. Harnessing Gas Fermentation

Gas fermentation, by using microbes to digest carbon dioxide, carbon monoxide, and methane and convert them to chemicals, could be one of the most cost-effective ways to reduce emissions from industrial processes. Scientists can create low-cost ethanol and other chemicals, to produce commodity chemicals and fuel blend stocks, although these can be made through traditional, low-cost petrochemical routes.

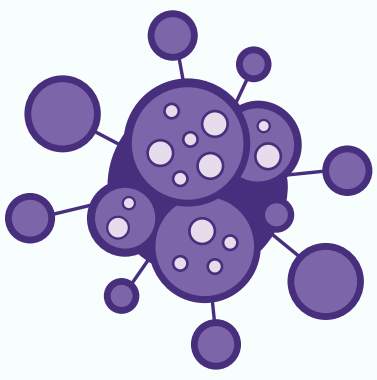


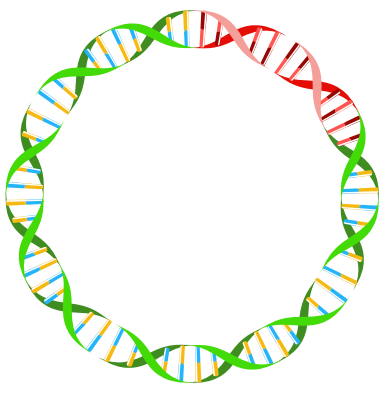
4. Genetic Vaccination

By cutting out and replacing genetic mutations that cause hereditary diseases, gene-editing technologies, such as CRISPR, pave the way for genetic vaccinations that target rare diseases with simple genetic variations. This could potentially be extended for more complex diseases and the ability to correct genetic mutations in human embryos. Harnessing the power of immunology and oncology together with synthetic biology, targeted vaccines and smart cancer immunotherapies are expected to be as commonplace as traditional vaccinations.

5. Self-Replicating Systems

In a self-replicating system, cells reproduce by cell division through a metabolic process of infection with cells acting as micro-factories coaxed along by enzymes to make billions and billions of copies of itself. One application of self-replicating systems is the implantation of a scaffold on the site of injury to give endogenous regenerative cells a favorable environment. This scaffold can be seeded with cells, growth factors, or cytokines to trigger natural growth responses. Cells can also be seeded on a scaffold to generate a functional tissue structure, which is then implanted. Another application of self-replicating systems is in the design of plants.





6. Streamlined Synthetic Biology with Acoustic Liquid Handling

Interchanging modular pieces of DNA is the preferred method for many DNA construction workflows due to decreased synthesis cost and faster progression along the design, build, test, and learn cycle. The Echo Acoustic Liquid Handler from Beckman Coulter Life Sciences has demonstrated the ability to generate DNA constructs using various assembly chemistries in combination with these modular pieces in a miniaturized workflow. The Echo enables lower-cost methods and workflows to quickly produce high-quality synthetic DNA constructs, which expands design-based testing with higher throughput and allows scientists to investigate a broader biological landscape.

Conclusion

Synthetic biology has the potential to solve some of the world's most pressing problems, from the production of clean meat and meat alternatives, to reducing the use of chemical pesticides that harm people and the environment. Technologies such as acoustic liquid handling can speed the design-test-build cycle of synthetic biology and help drive these discoveries.

For more information on acoustic liquid handling for synthetic biology please visit **becls.co/synbio**.