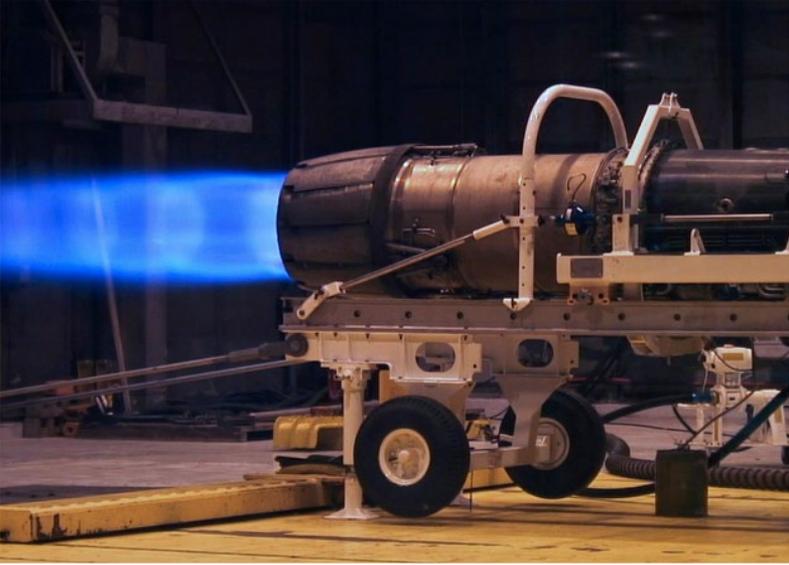


Biofuel



David Scrabulis, U.S. Navy / Wikimedia Commons

Engineered microorganisms can be used to make renewable fuels.

Synthetic biologists are working to create fuels using algae, bacteria, yeast, and other natural sources. Renewable diesel and jet fuels are already commercially available in limited amounts. In the future, biofuels and fuel blends may help reduce the world's dependence on petroleum, in turn reducing greenhouse gas emissions.



Pest Control



James Gathary, CDC / Wikimedia Commons

Engineered insects could protect crops and prevent the spread of disease.

The tools of synthetic biology could help control pest populations and protect against harms they cause to people and the environment. For example, new gene-editing technology could allow researchers to introduce specific mutations into mosquito populations. These mutations would prevent the insects from carrying certain diseases, reducing their ability to infect humans.



Biomedicine



CSIRO / Wikimedia Commons

Biosynthesis may make the production of medicine faster and more efficient.

New methods from synthetic biology can reduce materials, energy, and waste in the production of medications such as antibiotics and treatments for type 2 diabetes. For example, engineered enzymes can speed up chemical transformations. If essential drugs can be produced more efficiently, they may become more accessible to people who need them.



Cancer Treatment



Rhoda Baer / Wikimedia Commons

Medications created with synthetic biology could help us fight cancer.

Researchers have designed an experimental drug to treat soft-tissue cancers in the legs, arms, and abdomen. Drugs like this can precisely target the gene expressions in cells, allowing the therapy to “turn on” at the cancer site. They could allow doctors to use less of the medication, reducing side effects for patients.



Cleaning Products



tedestudio / iStock

Algae oil can help us make more environmentally friendly products.

Many household cleaning products use palm oil, which comes from palm trees that are planted and harvested in rainforests. Some “green” cleaning products have already replaced palm oil with algae oil, helping protect rainforest ecosystems. New synthetic biology techniques allow researchers to increase algae oil production.



Rubber Tires



BlackJack3D / iStock

Engineered bacteria can help us make rubber from renewable resources.

Many tires are made from a chemical called *isoprene* that is derived from petroleum. To help reduce the world's dependence on crude oil, researchers in the field of synthetic biology have been engineering bacteria to produce isoprene. This solution may one day be less expensive and more sustainable than using petroleum to make rubber.



Skin Moisturizers



Gary Hodges / NISE Network

Synthetic biology is creating animal-free ingredients for skincare products.

Oil-free moisturizers contain *squalene*, an ingredient that used to be extracted from shark livers through a process that is now prohibited. Squalene is also present in plants and other animals, but in smaller amounts. Synthetic biologists are engineering yeast to produce a molecule called *farnesene*, which can be used to produce squalene.



Synthetic Flavorings



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Synthetic biologists can engineer yeasts to produce food ingredients.

Some foods include ingredients that are “grown” by living and organic materials. For example, pure vanilla extract comes from the vanilla bean, but extracting it is costly. Artificial *vanillin*, produced in a laboratory, is inexpensive but it is not as flavorful as pure vanilla. Synthetic vanilla, produced by engineered yeast, is a cost-effective and flavorful option.

