Microbes and Innovation

AMERICAN SOCIETY FOR MICROBIOLOGY

Microbes and microbial processes are the foundation of the bioeconomy, creating new sustainable bio-based products and domestic energy sources and boosting agricultural production. The global bioeconomy is estimated to be worth between $4-30 trillion by 2030. Within the U.S., the bioeconomy will contribute at least 1.1 million jobs to the economy by 2030.

Examples of Microbial Products:

Biofertilizers. The application of substances with living plant growth-promoting microorganisms, known as biofertilizers, reduces the need for chemical fertilizers, reducing pollution and costs for farmers. Biofertilizers also improve soil health and productivity.

Biocements. Traditional cement alternatives made from microorganisms, such as bacteria and corals. Producing biocement emits less carbon than cement and can be made without heavy equipment. The U.S. Air Force is developing biocements that can be produced at remote airfields, protecting national security.

Biochar. A carbon-rich material produced by heating biomass in the absence of oxygen. Biochar can be used to improve soil health, store carbon, remediate polluted soils and improve soil moisture.

What policies do we need to harness the power of microbes for the future?

The U.S. government plays a key role in supporting bioeconomy research and development and regulating microbial product safety. Congress must take urgent action to boost coordination and support for biotechnology to maintain U.S. competitiveness and protect national security.

Increase funding for bioeconomy research and development at the National Science Foundation (NSF), the Department of Energy (DOE) and the U.S. Department of Agriculture (USDA). These agencies support basic research into microbial functions and microbial product development.

Invest in data infrastructure to store and share biological data, such as a precompetitive knowledge base to share what works and does not work in developing microbial products. This would lower production costs, increase scalability and speed up the commercialization of bioproducts.

Support additional coordination and government-wide bioeconomy strategy to assess and understand strengths and gaps in bioeconomy research, development, infrastructure and domestic supply chain resiliency. This includes government-wide coordination of biotechnology regulations.

Support evidence-based biosecurity and biosafety policies that address the security implications of existing, emerging and re-emerging health threats such as infectious diseases. Policies should promote the appropriate use of existing technology; anticipate and mitigate risks from emerging and disruptive technologies; and support surveillance and reporting systems.

Support workforce training and development programs at NSF, DOE, and the National Institutes of Health (NIH) to prepare the American workforce for future bioeconomy and biomanufacturing jobs. This includes training in bioprocess engineering, biofuel production and biobased materials development. A well-trained bioeconomy workforce will stimulate economic growth and revitalize local economies.

U.S. Federal Agency Roles in the Bioeconomy

The Office of Science and Technology Policy (OSTP) coordinates science and technology across the federal government and provides agencies with guidelines for implementing research security measures.

NSF supports microbial innovation through funding basic research into microbial functions, training the next generation of microbiologists and supporting critical research infrastructure. NSF also supports research security clearinghouses for researchers and implementing risk mitigation frameworks for NSF-funded research, as required by the CHIPS and Science Act.

The Food and Drug Administration (FDA) shares responsibility for regulating the bioeconomy with the EPA and USDA. The FDA evaluates the safety of plant and animal biotechnology innovations, biopharmaceuticals and genetically engineered microbe foods and products.

The Environmental Protection Agency regulates products produced by genetically engineering microbes, including biochemicals, biomass products and pesticides.

USDA regulates genetically engineered microbes used for plant production, food for human consumption, veterinary biologics and pesticides. The USDA also invests in research and infrastructure to support agriculture and rural economies including bioproducts and bioenergy.

The DOE Office of Science supports basic biological research, scientific computing infrastructure and training programs at the national laboratories. The Bioenergy Technologies Office, within the Office of Energy Efficiency and Renewable Energy, supports research, development and commercialization of bioproducts and biofuels.

The Department of Defense's BioMADE program and its network of biomanufacturers work to ensure U.S. national security and competitiveness through workforce development, supply chain resiliency and domestic capacity building.

NIH led the Human Microbiome Project and provides resources for microbial innovations, including data resources and funding for biomedical training and research.

Department of Homeland Security's programs play a central role assessing, detecting and responding to biological threats to ensure U.S. biosecurity.