

Rethink education to fuel bioeconomy, says report

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Microbes can be highly efficient, versatile and sophisticated manufacturing tools, and have the potential to form the basis of a vibrant economic sector. In order to take full advantage of the opportunity microbial-based industry can offer, though, educators need to rethink how future microbiologists are trained, according to a report by the American Academy of Microbiology.

"Industrial <u>microbiology</u> is experiencing a Renaissance; microorganisms make products ranging from the tightly regulated pharmaceuticals industry to large-scale production of commodity chemicals and biofuels. Educating and training the next generation of employees for these rapidly expanding industries is critically important to their survival," says Joy Doran-Peterson of the University of Georgia who chaired the steering committee that produced the report.

For thousands of years humans have harnessed the power of microbes to make products such as bread, cheese, beer and wine. In the early 20th century scientists discovered how to use mold to produce antibiotics. It has only been in the past few decades, with the advent of DNA-based technologies, that our understanding of the vast diversity of microbial capabilities has exploded.

"If there is a chemical you want to break down, there is probably a microbe that can do it. If there is a compound you wish to synthesize, a microbe can probably help," says the report, entitled Microbe-Powered Jobs: How Microbiologists Can Help Build the Bioeconomy. The report



provides a litany of examples of potential biological products including bioenergy, biofuels, environmentally friendly industrial chemicals, and bioenzymes (the production of which already fuels a nearly \$4 billion market).

To take full advantage of the potential the bioeconomy offers, academia needs to re-think and take a broader approach to teaching microbiology at the undergraduate level. According to the report, the future growth of a microbial-based industry sector depends on two crucial elements: expansion of the fundamental understanding of microbiology and translation of that understanding into viable products.

Current microbiology education primarily trains scientists with an eye toward academic research, which is what is needed to continue the expansion of knowledge. Most undergraduates that take microbiology, though, have an eye on a medical career, so many undergraduate microbiology curricula focus on the biomedical aspects of microbiology, according to the report.

"One can imagine that instead of the current situation where premedicine is virtually the only undergraduate program with a microbiology component, there could be a series of majors with microbiology at their cores," says the report.

One specific major, which the report outlines, could be an <u>industrial</u> <u>microbiology</u> track, with a focus towards translation. Not only would it emphasize microbiology, but it would also include quantitative skills important for success in industry. This type of curriculum could also be made available to engineering students in the form of a bioengineering track.

In addition to the traditional degree programs, the report also recommends other formats be used to teach specialized skills or offer



intensive introductions to new fields of study.

The <u>report</u> is based on the deliberations of experts who were gathered by the Academy to discuss the potential contributions of a microbepowered industry and the human elements needed for this emerging sector to thrive. The contents reflect the discussions of the colloquium and are not intended to reflect official positions of the American Academy of Microbiology or the American Society for Microbiology.

Provided by American Society for Microbiology

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