New Biotech Tools for a Cleaner Environment

FACT SHEET

Pollution control usually means adding equipment at the end of a process to capture or transform pollutants after they have been created. Devices ranging from a car's catalytic converter to a wastewater treatment plant to scrubbers on a power plant are technologies designed to manage pollution once it has already been created by everyday activities. American industry spends billions of dollars yearly on technology systems to manage waste and capture polluting emissions. In many cases, the limits of pollution control technology are being reached and new solutions are needed. The more sustainable and less expensive alternative is preventing pollution in the first place and biotechnology now offers new ways to accomplish this.

Industrial biotechnology is already beginning to reduce pollution and manufacturing costs in some industry sectors. It provides a whole new set of powerful biobased tools that hold great promise to further reduce pollution and the consumption of natural resources if deployed more broadly. It can reduce the cost of producing goods and, in many cases, can lead to improved consumer products.

The **New Biotech Tools for a Cleaner Environment** report, developed by the Biotechnology Industry Organization (BIO), discusses the evolution and recent blossoming of industrial biotechnology, pollution prevention policy, and the increasing potential for industrial biotechnology to offer new and even revolutionary ways to foster sustainable economic development. The report, released this week, begins with a review of the Organisation of Economic Cooperation and Development (OECD) cases studies (*The Application of Biotechnology to Industrial Sustainability*[1]) and goes on to address the question: **What if industrial biotechnology were more widely used?** The impact that the use of industrial biotechnology is having on the environment is overwhelmingly positive and offers new strategies to companies and government for cost effective environmental protection and industrial transformation. Some of the findings in the report include:

- Biotechnology process changes allow for ethanol transportation fuel production not only from corn but from cellulosic biomass such as crop residues; ***bioethanol*** *from cellulose generates 8 to 10 times as much net energy as is required for its production. It is estimated that one gallon of cellulosic ethanol can replace 30 gallons of imported oil equivalents.*

- The closed-loop nature of *using cellulosic biomass to produce bioethanol can contribute substantially to the mitigation of greenhouse gas emissions and can help provide a partial solution to global warming*. DOE estimates cellulosic ethanol production would absorb more CO_2 than would be emitted by its use.

[1] OECD, "The Application of Biotechnology to Industrial Sustainability," (2001).

- Biotechnology process changes in the **textile finishing** sector reduce water usage by about 17–18%, cost associated with water usage and air emissions by 50–60%, and energy demand for bleaching by about 9–14%. Textile mills may cut water consumption by as much as 30–50% by using biotechnology. Industry-wide use of biotechnology in the textile finishing industry would save about 3 trillion Btu per year—about the equivalent of one natural gas combined-cycle power plant or the electricity consumed by 28,120 homes in one year.

- Biotechnology process changes in **plastics production** replace petrochemical feedstocks with feedstocks made from organic material such as corn or even corn stovers, thereby reducing demand for petrochemicals by 20–80%. Because these bioplastics are biodegradable, their use could also reduce plastics in the waste stream by up to 80%. These bioplastics can be used to make products ranging from clothing to eating utensils or even car parts. Bioplastics made from PLA can be composted instead of disposed in landfills or incinerators. More than 80 billion pounds of plastic products are produced annually in the United States. Of that, 1 billion pounds are biobased plastics. If all plastics were made from biobased polylactic acid, oil consumption would decrease by 90–145 million barrels per year.

- Biotechnology process changes in **the nutriceutical and pharmaceutical sector** during production of riboflavin (vitamin B_2) reduce associated carbon dioxide emissions by 80% and water emissions by 67%. Changes in the production of the antibiotic cephalexin reduce carbon dioxide emissions by 50%, energy demand by 20%, and water usage by 75%. The market share of the biotechnology method of vitamin B_2 production increased from 5% in 1990 to 75% in 2002.

- Biotechnology process changes in the **production and bleaching of pulp for paper** reduce the amount of chlorine chemicals necessary for bleaching by 10–15%. If applied across the industry, these process changes could reduce chlorine in water and air as well as chlorine dioxide by a combined 75 tons per year. Biotechnology processes cut bleaching-related energy uses by 40%—a savings that can create additional pollution reductions. The biotechnology process also lowers wastewater toxicity including less of the very toxic dioxin.

These are but a few of the dramatic environmental and resource conservation improvements that could result with wider use of industrial biotechnology. Barriers to rapid adoption of industrial biotech process changes remain. Education and policy changes are needed to facilitate greater use of industrial biotechnology if we are to realize it important economic and environmental benefits.

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