Bioengineers succeed in producing plastic without the use of fossil fuels

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A team of pioneering South Korean scientists have succeeded in producing the polymers used for everyday plastics through bioengineering, rather than through the use of fossil fuel based chemicals. This groundbreaking research, which may now allow for the production of environmentally conscious plastics, is published in two papers in the journal *Biotechnology and Bioengineering* to mark the journal's 50th anniversary.

Polymers are molecules found in everyday life in the form of plastics and rubbers. The team, from the prestigious KAIST University and the Korean chemical company LG Chem, led by Professor Sang Yup Lee focused their research on Polylactic Acid (PLA), a bio-based polymer which holds the key to producing plastics through natural and renewable resources.

"The polyesters and other polymers we use everyday are mostly derived from fossil oils made through the refinery or chemical process," said Lee. "The idea of producing polymers from renewable biomass has attracted much attention due to the increasing concerns of environmental problems and the limited nature of fossil resources. PLA is considered a good alternative to petroleum based plastics as it is both biodegradable and has a low toxicity to humans."

Until now PLA has been produced in a two-step fermentation and chemical process of polymerization, which is both complex and expensive. Now, through the use of a metabolically engineered strain of

E.coli, the team , have developed a one-stage process which produces polylactic acid and its copolymers through direct fermentation. This makes the renewable production of PLA and lactate-containing copolymers cheaper and more commercially viable.

"By developing a strategy which combines metabolic engineering and enzyme engineering, we've developed an efficient bio-based one-step production process for PLA and its copolymers," said Lee. "This means that a developed *E. coli* strain is now capable of efficiently producing unnatural polymers, through a one-step fermentation process,"

This combined approach of systems-level metabolic engineering and enzyme engineering now allows for the production of polymer and polyester based products through direct microbial fermentation of renewable resources.

"Global warming and other environmental problems are urging us to develop sustainable processes based on renewable resources," concluded Lee. "This new strategy should be generally useful for developing other engineered organisms capable of producing various unnatural polymers by direct fermentation from renewable resources".

Source: Wiley (news : web)