

Commercial yeasts upgraded with an enzyme for biofuel production

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Eckhard Boles, co-founder of the Swiss biofuel company Butalco GmbH and a professor at Goethe-University in Frankfurt, Germany, has discovered a new enzyme which teaches yeast cells to ferment xylose into ethanol. Xylose is an unused waste sugar in the cellulosic ethanol production process. The researchers have recently filed a patent application for their process.

In industrial fermentation processes, the yeast *Saccharomyces cerevisiae* is commonly used for ethanol production. Current bioethanol production technologies can use only parts of the plants, namely the storage sugars, like glucose, sucrose or starch. However, this technology is in competition with food and feed production. Eckhard Boles, co-founder of the Swiss biofuel company Butalco GmbH and a professor at Goethe-University in Frankfurt, Germany, has therefore searched for ways of teaching the microorganisms to convert waste sugars, xylose and arabinose, into ethanol. Now, Boles and his colleagues have succeeded in genetically modifying industrial yeast strains, thus producing ethanol from xylose in a single step. Having already succeeded in transforming arabinose into ethanol by genetically modified yeast strains, Boles and his team have now found an efficient way to convert most of the plants energy into biofuel.

"Up to now scientists considered it as unpromising to equip yeast with a bacterial enzyme capable of converting xylose", Boles explains, "because all attempts had failed". But he and his team continued trying by exploring the enormous amounts of information in current genetic

databases. Step by step they took 12 enzymes from different bacterial organisms and inserted the enzymes into yeast cells. Finally they discovered a new enzyme that even worked in yeast cells from a commercial ethanol plant. In contrast to current cellulosic ethanol technologies the new enzyme can convert xylose in a single step and is not inhibited by other chemical compounds normally present within the yeast cells. The researchers have recently filed a patent application for their process. "This is a break-through in the commercialisation of cellulosic ethanol", comments Boles.

Boles says: "We have successfully demonstrated the conversion of waste sugars into ethanol. However, ethanol is not the best renewable biofuel. There are other alcohols with many more promising properties." Together with his company, Butalco GmbH, Boles is now constructing yeast strains to convert plant waste materials into biobutanol, which is being seen as a more superior alternative fuel than ethanol due to its more favourable chemical and physical properties.

Source: Goethe University Frankfurt

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