Scientists create new 'Y-shaped' synthetic consortium for efficient bio-manufacturing

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A group of Chinese scientists have recently developed a new synthetic consortium for efficient pentose-hexose co-utilization that could improve bio-manufacturing. Converting biomass into valuable fuels and

chemicals using microbes is a hot topic in bio-manufacturing. However, inefficient pentose-hexose co-utilization has hindered the conversion process.

Professor Li Yin and his team at the Institute of Microbiology of the Chinese Academy of Sciences (IMCAS) proposed using a Y-shaped consortium to solve this problem. They took butanol as the target product and developed a Y-shaped synthetic consortium using systematically engineered E. coli strains.

The "Y-shaped" synthetic consortium is composed of two engineering strains derived from the same original strain. The two separate "heads" represent the pentose and hextose metabolic pathways, while the unitary "body" represents the synthetic pathway of the target product.

In batch fermentation of mixed sugars, this Y-shaped synthetic consortium has achieved a yield of ~21 g/L butanol. This represents 85% of the theoretical value, the highest percentage yield ever reported, according to Li's team.

Further analysis has shown that efficient simultaneous utilization of sugar mixtures with different pentose/hexose ratios and different aeration conditions can be achieved by adjusting the initial structure of the Y-shaped consortium.

"This further indicates the adaptability and stability of the Y-shaped consortium, which may be used in industrial production," said Li.

This work provides new insights into efficient pentose-hextose co-utilization by a synthetic microbiome. It also lays a foundation for further reducing the cost of producing biobutanol.

More information: Chunhua Zhao et al, Design and development of a

"Y-shaped" microbial consortium capable of simultaneously utilizing biomass sugars for efficient production of butanol, *Metabolic Engineering* (2019). DOI: 10.1016/j.ymben.2019.06.012

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