Max-Planck-Innovation

Technology Offer

Biosynthetic production of Paclitaxel

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The diterpenoid paclitaxel (taxol) is a chemotherapy medication widely used as a first-line treatment against several types of solid cancers. However, adequate supply has remained a major challenge. Extraction of paclitaxel from natural sources is limited, while the chemical synthesis is complex and economically unfavourable. Currently paclitaxel is mainly produced by microbial fermentation or in plant cell cultures with low overall yields. Ideally, paclitaxel production is reconstructed in a heterologous host such as *Saccharomyces cerevisiae*. However, the biosynthetic pathway for paclitaxel must first be fully elucidated for metabolic engineering strategies to be feasible.

Technology

Our scientists from the Max-Planck-Institute of Molecular Plant Physiology have identified the complete gene set required for the heterologous production of paclitaxel. They elucidated the missing steps from the current model of paclitaxel biosynthesis and confirmed the activity of most of the missing enzymes via heterologous expression in *Nicotiana benthamiana*. Notably, they identified a new C4b-C20 epoxidase that could overcome the first bottleneck of metabolic engineering. By using both previously characterized and newly identified oxomutases/epoxidases, taxane 1b-hydroxylase, taxane 9a-hydroxylase, taxane 9a-dioxygenase, and phenylalanine-CoA ligase, the key intermediate baccatin III was successfully biosynthesized and converted into paclitaxel in Nicotiana benthamiana.

We are now looking for a commercial partner to further develop this project.

Publication

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Patent Information

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