生物策略格式

KJC, 2019/10/21

類別	生物策略 (Strategy)
生物策略 STRATEGY	細菌酵素製造碳氫化合物 (Bacterial enzymes produce hydrocarbons)
生物系統 LIVING SYSTEM	延長聚球藻 *Synechococcus elongatus*
功能類別 FUNCTIONS	#化學性組成有機化合物 #化學能轉型 # Chemically assemble organic compounds #Transform chemical energy
作用機制標題	由簡單脂肪酸產生長鏈烷烴和烯類 (Produce long-chain alkanes and alkenes from simple fatty acid.)
生物系統/作用機制示意圖	

作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)

某些藍綠細菌門 (cyanobacteria)，如細長聚球藻 (*Synechococcus elongatus*)，能利用醯基--醯基載體蛋白還原酶 (acyl–acyl carrier protein reductase) 和醛脫羰基酶 (aldehyde decarbonylase)，將脂肪代謝中產物轉化為長鏈烷烴和烯烴，以生成 C13 和 C17 這類的奇數碳鍊。令人訝異的是其中有 80%的產物在合成後離開細胞，意謂著在過程中可能的碳匯作用 (carbon-sink) 角色。

Certain strains of cyanobacteria, like *Synechococcus elongatus*, can produce long-chain alkanes and related alkenes from simple fatty acid precursors using a pair of enzymes (like acyl–acyl carrier protein reductase and aldehyde decarbonylase). The pathway together convert intermediates of fatty acid metabolism to alkanes and alkenes and production and secretion of C13 to C17 mixtures of alkanes and alkenes. Remarkably, more than 80% of the hydrocarbon product leaves the cell after synthesis which suggests a possible carbon-sink role for the process.

文獻引用 (REFERENCES)

「在這裡，我們描述了從藍細菌中發現烷烴生物合成途徑。 該途徑由酰基 - 酰基載體蛋白還原酶和醛脫羰基酶組成，它們將脂肪酸代謝中間體一起轉化為烷烴和烯烴.....生成和分泌 C13 至 C17 烷烴和烯烴的混合物.....十七烷是最豐富的烷烴。這些光合自營細菌，與烷烴的「n - 1」規則一致，由典型偶數脂肪醛的脫羰得到...這些菌株中的 10 個產生

烷烴，主要是十七烷和十五烷，以及烯烴，可能來自不飽和脂肪酸醛類。」 (Schirmeret al. 2010: 559)

"Here we describe the discovery of an alkane biosynthesis pathway from cyanobacteria. The pathway consists of an acyl–acyl carrier protein reductase and an aldehyde decarbonylase, which together convert intermediates of fatty acid metabolism to alkanes and alkenes…production and secretion of C13 to C17 mixtures of alkanes and alkenes…Heptadecane is the most abundant alkane reported in these photoautotrophic bacteria, an observation consistent with the 'n – 1' rule for alkanes, resulting from decarbonylation of typically even-numbered fatty aldehydes…Ten of these strains produced alkanes, mainly heptadecane and pentadecane, along with alkenes, presumably derived from unsaturated fatty aldehydes." (Schirmer et al. 2010: 559)

參考文獻清單與連結 (REFERENCE LIST)

Schirmer, A., M. A. Rude, X. Li, E. Popova, and S. B. del Cardayre. (2010). Microbial biosynthesis of alkanes. *Science* 329: 559-562. (https://science.sciencemag.org/content/329/5991/559)

延伸閱讀:

生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)

https://en.wikipedia.org/wiki/synechococcus_elongatus

文章貢獻/編修者與日期:

顏子傑翻譯 (2018/10/22)；洪舜德翻譯 (2019/04/28)；朱天愛編修(2019/12/19)；吳晧編修(2020/01/04)；譚國鏊編修 (2020/07/30)；許秋容編修 (2020/11/26)；紀凱容編修(2020/11/26)

AskNature 原文連結

https://asknature.org/strategy/bacterial-enzymes-produce-hydrocarbons/