

5.2 Synthetic & Systems biology: experimental, theoretical and computational approaches for the analysis of micro and biological systems

Synthetic biology approaches to engineer polyphenols microbial cell factories

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Polyphenols are secondary metabolites isolated from plants that can be divided into flavonoids, stilbenoids, curcuminoids, coumarins, polyphenolic amides and lignans. These exhibit diverse biological and potential therapeutic activities including antioxidant, anti-inflammatory and anticancer, among others. Despite all this potential, extracting polyphenols from plants is not straightforward given the low yields of the process. The extracted amounts are not sufficient to respond to the increasing demand for polyphenols, the process is expensive and unfriendly for the environment. Hence, developing microbial cell factories to effectively produce polyphenols arises as an attractive way to address the mentioned limitations and produce high amounts of these compounds. Advances in the metabolic engineering and synthetic biology fields have been key in the design of efficient and robust microbial cell factories, mainly due to the development of proper molecular biology tools, as well as to the unravelling of new enzymes in plants or other organisms to better engineer such heterologous pathways. Several hosts have been explored as potential polyphenols microbial cell factories. However, there is still a long way before this production at an industrial scale can become a reality. The perspectives and current challenges resulting from these developments will be discussed.