Bacterial Synthetic Biology as a strategy towards production of value-added xeno-compounds

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Fluorine is a key element in the synthesis of molecules broadly used in medicine, agriculture and materials. Addition of fluorine to organic structures represents a unique strategy for tuning molecular properties, yet this atom is rarely found in Nature and approaches to integrate fluorometabolites into the biochemistry of living cells are scarce. To overcome this state of affairs, we have engineered synthetic gene circuits for organofluorine biosynthesis in the platform bacterium *Pseudomonas putida*. By harnessing fluoride-responsive riboswitches and the orthogonal T7 RNA polymerase, biochemical reactions needed for *in vivo* biofluorination are wired to the presence of fluoride (i.e. circumventing the need of feeding expensive additives). Biosynthesis of fluoronucleotides and fluorosugars in engineered *P. putida* is demonstrated with mineral fluoride both as the only fluorine source (i.e. as a substrate of the pathway) and as inducer of the synthetic circuit. I will also discuss how these *neo*-metabolism approaches expand the chemical landscape of cell factories by providing new alternative biosynthetic strategies towards fluorinated building-blocks.