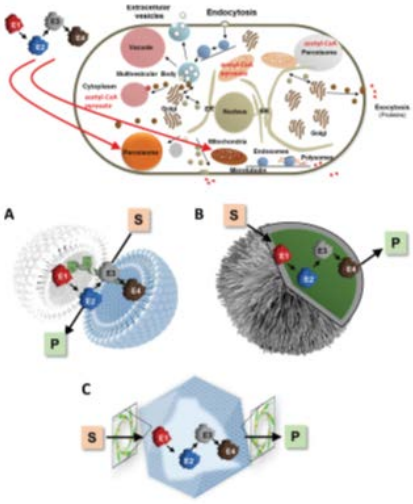

Versatile Biocatalyst Scaffold System

Industrial biocatalysis is an economically attractive option for producing valuable commodity chemicals, pharmaceuticals and food ingredients. Multi-enzyme biocatalytic cascades enhance cheap building blocks and commodity target molecules, and spatial organization may overcome barriers caused by slow or inhibited enzymes and/or biocatalyst instability. Optimizing spatial organization of enzymes can significantly increase biocatalysis efficiency, which is a challenge in co-localizing enzymes in a cascade to optimize reaction conditions. This technology provides a self-assembling scaffold and attachment system that allows for co-localizing enzymes in multi-enzyme biocatalytic cascades.

Description of the Invention

An innovative protein-based scaffold optimizes the spatial connections among multiple enzymes in biocatalytic reactions. This technology uses a new type of self-assembling protein to form the scaffold and a better tagging system for attaching enzymes on the scaffold. This combination significantly improves biosynthetic efficiency with a robust and modular self-assembling protein scaffold (using the bacterial microcompartment shell protein EutM from Salmonella enterica) and methods to localize cargo proteins to the scaffold using SpyTag-Spycatcher. Scaffolding of enzymes can reduce diffusion of reaction intermediates and increase reaction efficiency. Synthetic scaffolds have been shown to significantly increase the function of different designed pathways.

Features and Benefits

- Rapid *in vitro* prototyping of scaffolds from different building block modules to optimize catalyst microenvironments and spacing
- Optimizes spatial connections among multiple enzymes in biocatalytic reactions
- Robust and modular self-assembling protein scaffold uses the bacterial microcompartment shell protein EutM from Salmonella enterica
- Scaffold may be self-assembled *in vivo* or *in vitro*
- Scaffolding of enzymes has the potential to increase reaction efficiency
- Synthetic scaffolding increases the function of different designed pathways
- Co-localizes enzymes in multi-enzyme biocatalytic cascades
- Large-scale recombinant production of assembly building blocks and catalysts
- Catalyst recycling enables efficient, cost effective catalyst use
- Ready for future incorporation in cell-free production systems

Potential Applications

- Biosynthesis of chemicals, pharmaceuticals or food ingredients difficult or impossible to synthesize chemically
- Diagnosis/detection kits or tools that require multiple-enzyme reactions (for industrial, scientific, medical and/or environmental purposes)

Technology Status

Proof of Concept.

Publications

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IP Status

Patent Pending

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Case Reference

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