High-Throughput Selection Platform to Obtain NMN+-Utilizing Enzymes Through Directed Evolution

Tech ID: 32938 / UC Case 2022-952-0

BRIEF DESCRIPTION

Noncanonical redox cofactor-based biotransformation is an attractive low-cost alternative to traditional cell-free reductive biotransformation. However, engineering enzymes to utilize noncanonical redox cofactors has been challenging. Addressing this problem, researchers at UC Irvine have developed a high-throughput directed evolution platform that enables development of such enzymes with ~147-fold improved catalytic efficiency, which translates to an industry-viable total turnover number of ~45,000 in cell-free biotransformation without requiring high cofactor concentrations.

SUGGESTED USES

High-throughput discovery of enzymes to utilize noncanonical redox cofactors in cell-free biotransformation

FEATURES/BENEFITS

·Economical and scalable biotransformation

·High catalytic efficiency for practical applications:

» Industry viable turnover number of ~45,000 in cell-free biotransformation without requiring high cofactor concentrations

TECHNOLOGY DESCRIPTION

Cell-free biotransformation is a prominent tool in the production of renewable chemicals, fuels, and pharmaceuticals. Recently, noncanonical redox cofactor-based biotransformation has emerged as a promising low-cost alternative to traditional cell-free reductive biotransformation. However, a significant hurdle blocking the widespread use of noncanonical cofactors in biotransformation is the lack of efficient and diverse enzymes that can utilize them. Most enzymes engineered to use noncanonical cofactors do so with catalytic activities too low for practical applications.

Researchers at University of California, Irvine have developed a simple, high-throughput platform to obtain enzymes that can utilize noncanonical redox cofactors with high catalytic efficiency. Enzymes developed with this system may become transformative tools in reductive biotransformation, as they are able to function near their maximum catalytic velocity even at sub-milllimolar cofactor concentrations. Rapid development of such enzymes via this novel platform will enable more economical and scalable biotransformation. Furthermore, a general design principle developed by this novel selection platform will lead to engineering of other noncanonical redox cofactor-dependent enzymes.

STATE OF DEVELOPMENT

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OTHER INFORMATION

CATEGORIZED AS

» **Biotechnology**
» Industrial/ Energy
» **Materials & Chemicals**
» Chemicals
» **Medical**
» Research Tools

RELATED CASES

2022-952-0

Selection platform has been validated to function as intended. Application of the obtained enzymes in biotransformation has been examined and validated in vitro.

PATENT STATUS

Patent Pending

RELATED MATERIALS

» Zhang, Linyue et al. “Directed Evolution of Phosphite Dehydrogenase to Cycle Noncanonical Redox Cofactors Via Universal Growth Selection Platform.” Nature Communications, vol. 13, no. 5021, 2022, doi: https://doi.org/10.1038/s41467-022-32727-w. - 08/26/2022

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