

Conserved RHR Motif Enables Widespread Use Of Non-Canonical Redox Cofactors In Aldehyde Dehydrogenases

Tech ID: 34656 / UC Case 2025-584-0

ABSTRACT

This technology improves enzymatic activity and biomanufacturing cost by engineering a conserved motif into enzymes and utilizing low-cost non-canonical redox cofactors.

FULL DESCRIPTION

Biomanufacturing relies on enzymes and cells to produce fuels, materials, medicines, and foods, however, the enzymes use costly natural redox cofactors (NAD(P)+) with inherent electron delivery issues. This technological invention identifies a conserved sequence motif that enables a class of enzymes to bind and utilize non-canonical redox cofactors (NRC), which are more cost-effective than NAD(P)+. One-third of these enzymes naturally contain this motif, whereas for the remaining two-thirds, introducing the motif enhanced their NRC activity by up to 60-fold, surpassing the performance of nearly all known natural and previously engineered NRC-active enzymes. The motif can be transferred into diverse enzymes to significantly boost their NRC activity, enabling precise enzyme design and modification for superior low-cost biomanufacturing performance.

APPLICATIONS

- ▶ Cost-effective biomanufacturing of fuels, chemicals, and specialty materials.
- ▶ Industrial biocatalysis requiring efficient electron transfer.
- ▶ Pharmaceutical production involving enzyme-mediated synthesis.
- ▶ Food and beverage industries leveraging enzyme transformations.

FEATURES/BENEFITS

- ▶ Enables use of low-cost, biomimetic non-canonical redox cofactors (NRCs).
- ▶ Significantly enhances enzyme activity towards NRCs by up to 60-fold.
- ▶ Transferable motif allows broad enzyme engineering and customization.
- ▶ Improves electron delivery precision in biocatalytic processes.
- ▶ Reduces reliance on expensive natural cofactors like NAD(P)+.

PATENT STATUS

Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Remediation of Volatile Phenols in Smoke-Exposed Fruit](#)

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OTHER INFORMATION

CATEGORIZED AS

- ▶ **Biotechnology**
 - ▶ Other
- ▶ **Energy**
 - ▶ Bioenergy
- ▶ **Materials & Chemicals**
 - ▶ Biological
 - ▶ Chemicals
 - ▶ Polymers
- ▶ **Research Tools**
 - ▶ Other

RELATED CASES

2025-584-0

- ▶ Engineered Phosphite Dehydrogenases for Recycling Orthogonal Noncanonical Cofactors
- ▶ Biological Conversion of Ethylene to n-Butanol and Other Chemicals Using E. Coli
- ▶ High-Throughput Selection Platform to Obtain NMN+-Utilizing Enzymes Through Directed Evolution
- ▶ Novel Enzymes Enabling Microbial Fermentation of Sugar into Long Chain Alcohols

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