

# Engineered Phosphite Dehydrogenases for Recycling Orthogonal Noncanonical Cofactors

Tech ID: 34655 / UC Case 2025-583-0

## ABSTRACT

Engineered phosphite dehydrogenases enable efficient recycling of noncanonical redox cofactors for sustainable biomanufacturing.

## FULL DESCRIPTION

Researchers at UC Irvine and UC Davis engineered phosphite dehydrogenase (PTDH) enzymes to recycle noncanonical redox cofactors (NRCs) with high specificity and efficiency. Using a high-throughput evolution platform, they identified PTDH variants that minimally interfere with native NAD(P)H-dependent redox processes, enabling precise delivery of reducing power to target biotransformations. This approach leverages low-cost phosphite as an electron donor, validated by successful production of a pharmaceutical intermediate in both whole cells and lysates.

## APPLICATIONS

- ▶ Sustainable and economical biomanufacturing of pharmaceuticals and fine chemicals.
- ▶ Development of orthogonal enzymatic pathways for synthetic biology.
- ▶ Biocatalyst development for industrial biotransformations.
- ▶ High-throughput enzyme engineering platforms.

## FEATURES/BENEFITS

- ▶ High specificity and efficiency in recycling orthogonal noncanonical redox cofactors.
- ▶ Cost-effective use of phosphite as an electron source.
- ▶ Reduced metabolic crosstalk by silencing native NAD(P)H pathways.
- ▶ Enables precise control of redox reactions in vivo and in vitro.

## PATENT STATUS

Patent Pending

## ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Remediation of Volatile Phenols in Smoke-Exposed Fruit](#)
- ▶ [Biological Conversion of Ethylene to n-Butanol and Other Chemicals Using E. Coli](#)

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## INVENTORS

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## OTHER INFORMATION

### CATEGORIZED AS

- ▶ **Materials & Chemicals**
  - ▶ Biological
  - ▶ Chemicals
- ▶ **Medical**
  - ▶ New Chemical Entities, Drug Leads
- ▶ **Research Tools**
  - ▶ Screening Assays

### RELATED CASES

2025-583-0

- ▶ High-Throughput Selection Platform to Obtain NMN+-Utilizing Enzymes Through Directed Evolution
- ▶ Novel Enzymes Enabling Microbial Fermentation of Sugar into Long Chain Alcohols
- ▶ Conserved RHR Motif Enables Widespread Use Of Non-Canonical Redox Cofactors In Aldehyde Dehydrogenases

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