

# Enzymatic Precision: Advancing Complex Small Molecule Synthesis using Biocatalysis

Presented by

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# Biocatalyst Adoption for Manufacturing of Drug Substance

Limited Operating  
Conditions

Lack of Designability  
and Stability of  
Biocatalyst

Public Hurdles

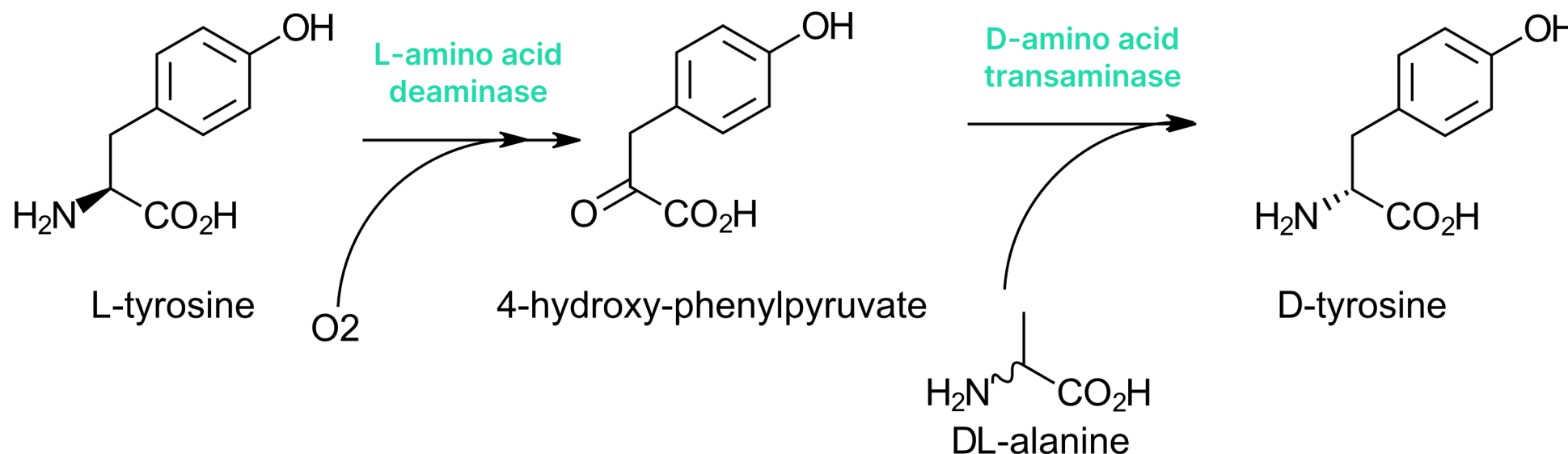
Regulatory Hurdles

Waste Stream  
Complexity

Formation of  
Unwanted By-  
Products

# Biocatalyst enantioselectivity

## Coupled biocatalytic stereoinversion of amino acids

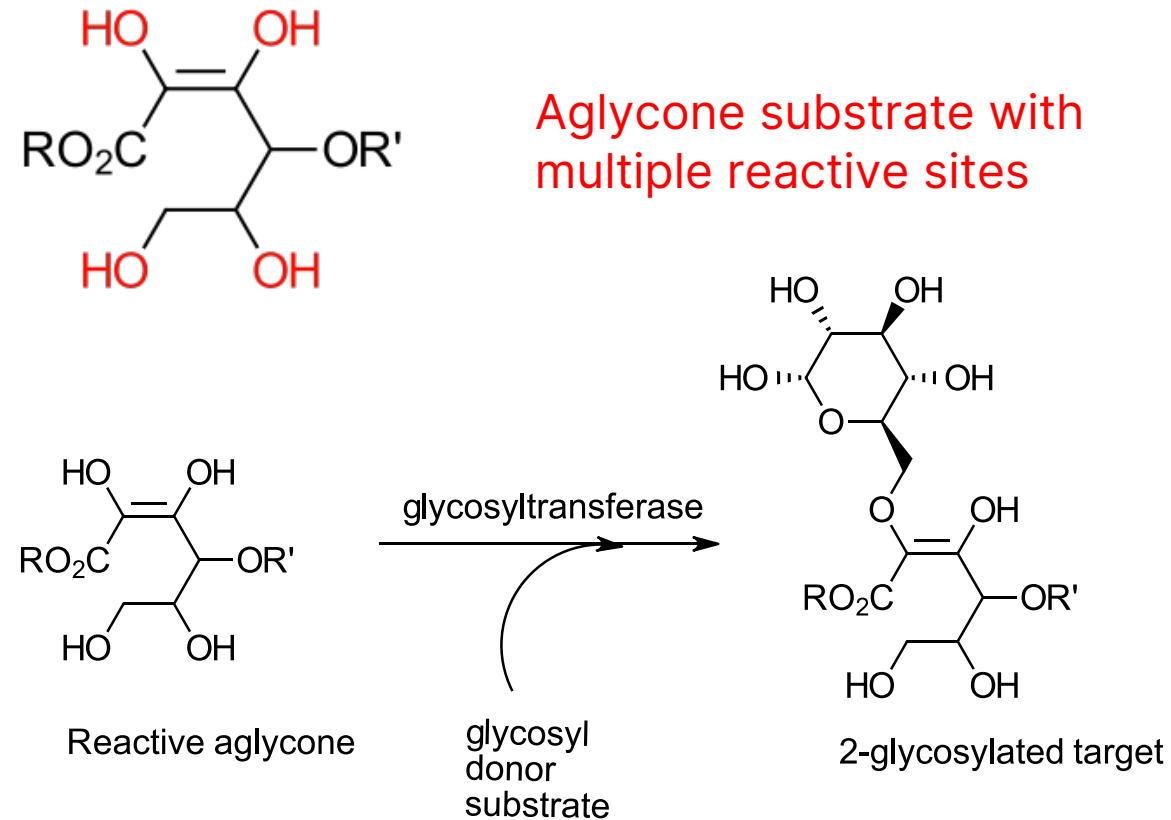


- D-tyrosine
- 70% isolated yield
- >99% e.e.

**Result: Competitive PMI and COGS**

# Biocatalyst selectivity

## Regioselective glycosylation



**Result: Competitive PMI and COGS**

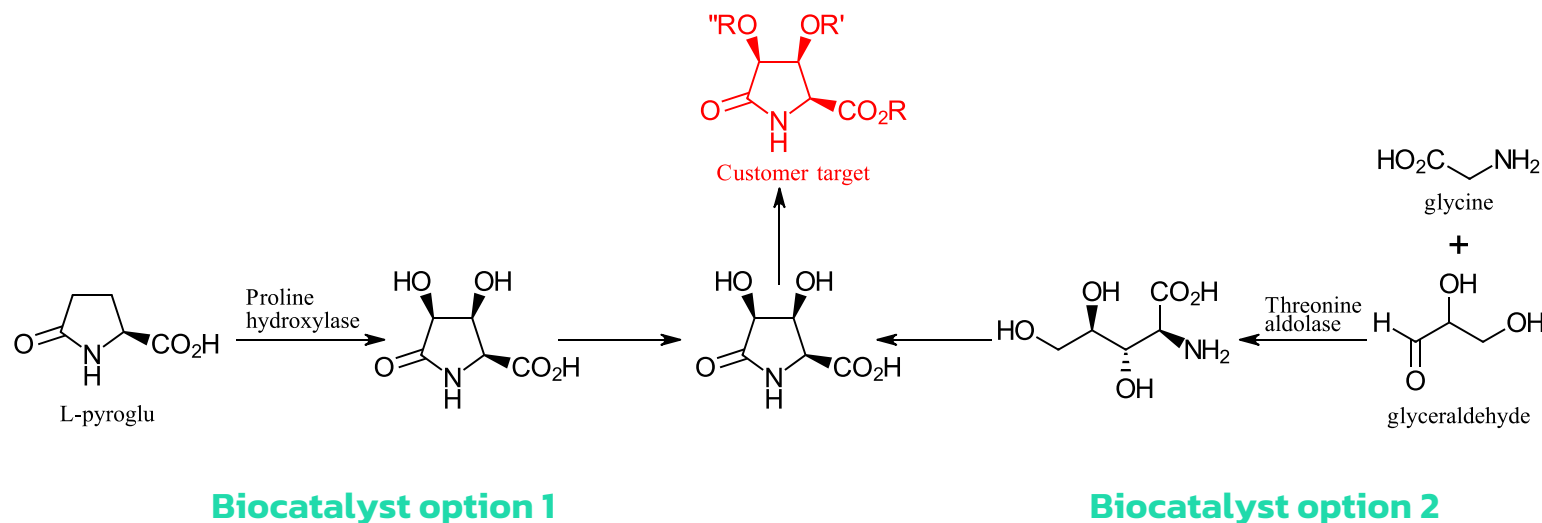
# Retrobiosynthetic analysis

## Bioynthesis of substituted pyrrolidinone

**Client route has 10 chemical steps with multiple protection/deprotection.**



**Two Ingenza biocatalytic routes**  
**Each has 1 enzyme step and 2 chemical steps**

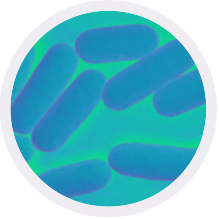


**Result: Far superior PMI**

# *inGenius*<sup>®</sup> host organisms

## Recombinant biocatalyst production

### Intracellular biocatalyst production



*Escherichia coli*

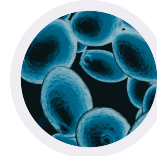


*Corynebacterium glutamicum*



*Pseudomonas putida*

### Extracellular biocatalyst production



*Saccharomyces cerevisiae*



*Bacillus sp.*



*Pichia pastoris*



*Aspergillus niger*

# Efficient biocatalyst production

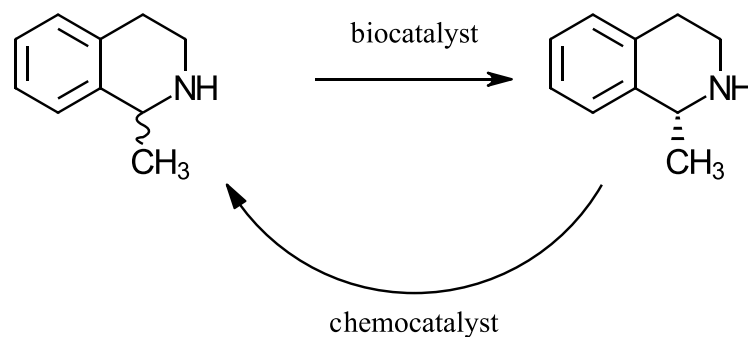
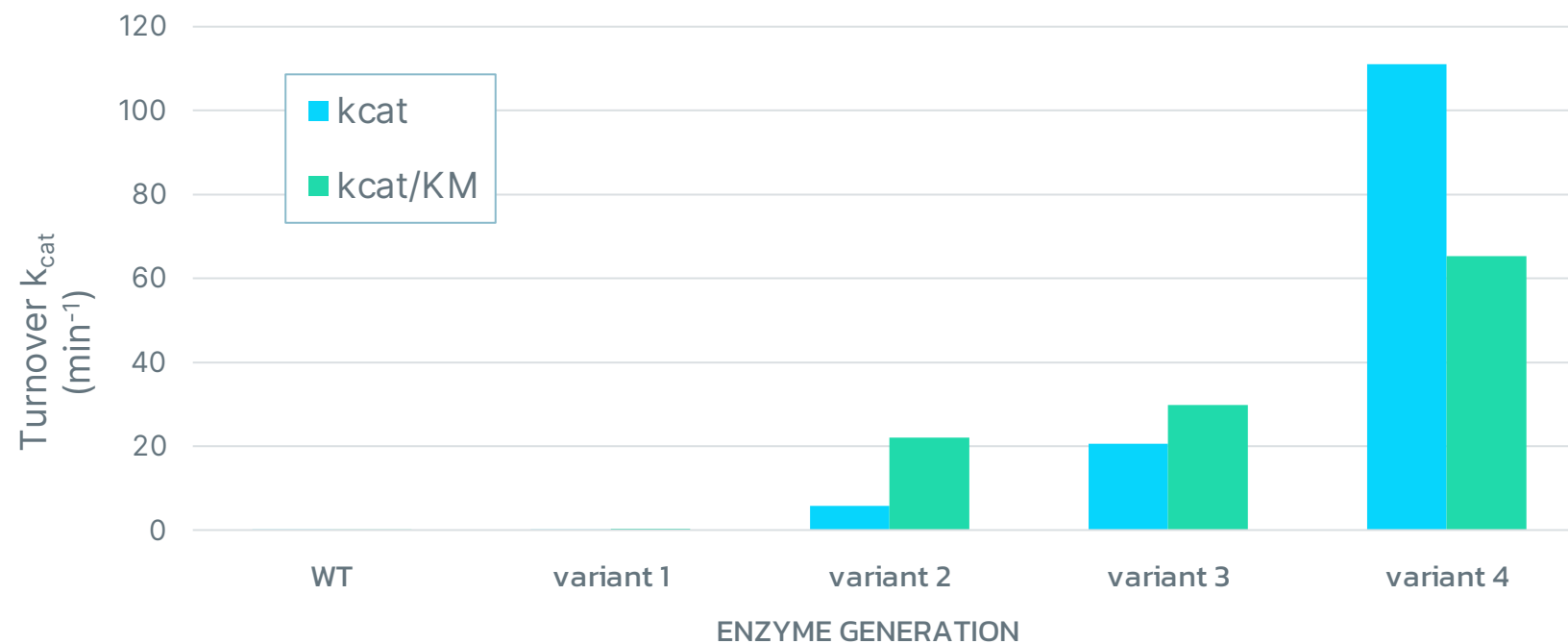
Biocatalyst production enhanced machine learning (ML): **codABLE™**

**Control**

**Gene synthesis  
providers**

**codABLE™**





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