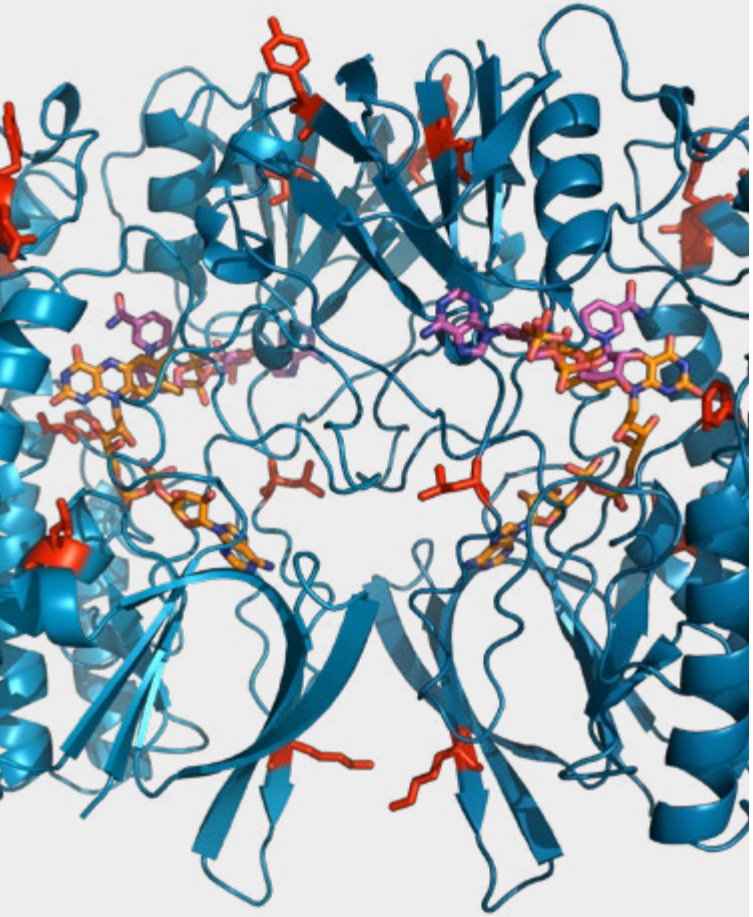
Gecco Biotech & Zymvol

Rapid enzyme stabilization using FRESCO



Groningen Enzyme & Cofactor Collection

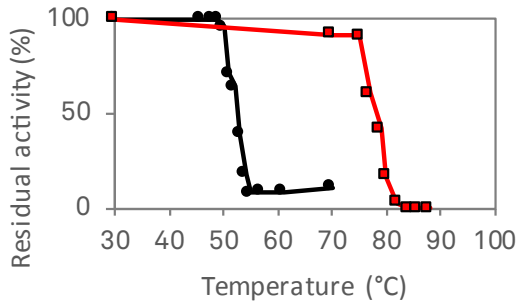
In Silico Enzyme Revolution

Stable enzymes

Enzymes are often perfect catalysts for a reaction, but the instability of enzymes can limit economical applications. A stable enzyme allows for more extreme reaction conditions, lower enzyme loading, longer catalyst lifetime and simplified enzyme processing. All these factors directly influence the economics of a process, making improvements in stability often more effective compared to improvements in activity.

FRESCO

FRESCO (Framework for Rapid Enzyme Stabilization by Computational libraries) is a protocol developed by Dr. Hein J. Wijma and Prof. dr. Dick B. Janssen at the University of Groningen. All potential mutations in an enzyme are screened *in silico* for stabilization potential using Rosetta and FoldX. This small set of mutants is screened for stability and activity and typically contains >10% hits. By combining beneficial mutations, the apparent melting point of enzymes is typically increased by 15°C to 30°C while retaining all enzymatic activity.



Inactivation profile for limonene epoxide hydrolase (black) and the FRESCO stabilized mutant (red)

Gecco Biotech

GECCO bridges the gap between academic research and industry by engineering enzymes to achieve peak performance, and by supplying existing oxidative enzymes. GECCO also uses state of the art techniques to deliver novel enzymes. Our mutagenesis and screening pipeline can be applied for computational designs, rational designs, efficient libraries or sets of homologous genes.

Zymvol

ZYMVOL accelerates and enables the discovery and development of new industrial enzymes through computer simulations. Their proprietary molecular modeling software, ZYMEVOLVER, has been designed to provide quick and accurate predictions to fast forward enzyme engineering projects. It includes: enzyme-substrate interactions modeling with full protein dynamics (side-chain and protein backbone), fast *in silico* mutagenesis and sequence/structure-activity relationships.

FRESCO examples

Limonene epoxide hydrolase (LEH)
+35°C T_M
Wijma *et al.* (2014) PEDS, 27:49-58

Haloalkane dehalogenase (LinB)
+23°C T_M
Floor *et al.* (2017) ChemBioChem, 15:1659–1671

HMF oxidase (HMFO)
+12°C T_M
Martin *et al.* (2018) Biotechnol Biofuels, 11:56

Peptide amidase (PAM)
+23°C T_M
Wu *et al.* (2016) ACS Catal, 6:5405-5414

Halohydrin dehalogenase (HheC)
+28°C T_M
Arabnejad *et al.* (2016) PEDS, 30:175-189

Cyclohexanone monooxygenase (CHMO)
+13°C T_M
Fürst *et al.* (2019) Biot Bioeng, doi: 10.1002/bit.27022

Glucose oxidase (GOD)
+9°C T_M
Mu *et al.* (2019) Int. J. Biol. Macromol, doi: 10.1016/j.ijbiomac.2019.06.094

Gecco and Zymvol

Complementary expertise

Using the *in silico* expertise of ZYMVOL, small sets of potentially beneficial mutations in enzymes can be generated. These small sets can be tested using the experimental expertise of GECCO to quickly achieve success in enzyme engineering.

By collaborating closely, we deliver state of the art *in silico* design partnered with reliable experimental validation while making optimal use of screening capacity. This effective approach allows both GECCO and ZYMVOL to focus on their respective strengths while combining the powers of computation and biology.

Throughout multiple successful projects for multinational companies we have shown the power of this collaboration to deliver improved enzymes.

gecco-biotech.com

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