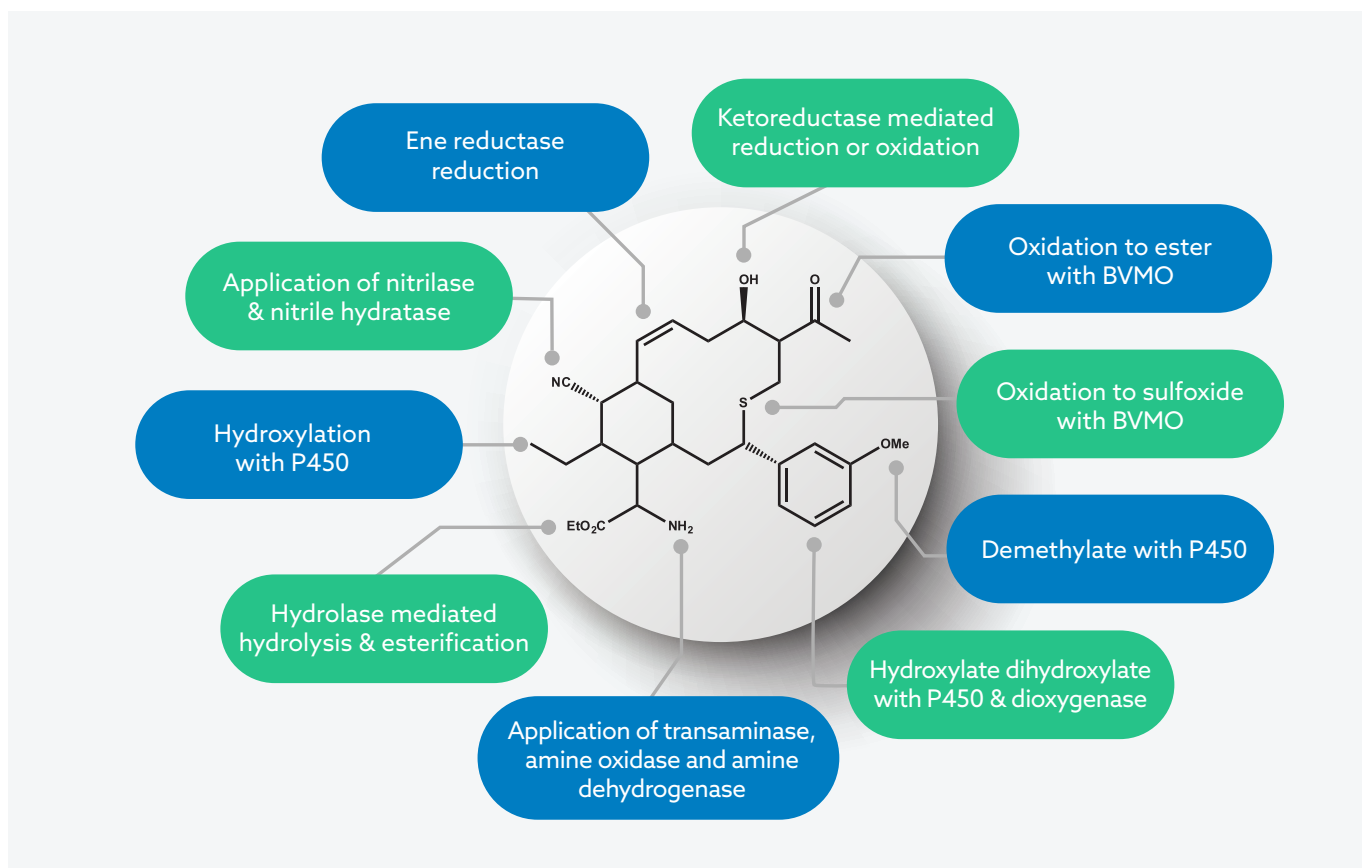


selectAZyme™

- **selectAZyme™** exclusive technology platform of recombinant enzyme libraries
- Integrated computational, biology and chemistry groups
- Enzyme libraries supply and enzyme screening
- Biotransformation process development and chemical processing expertise
- Fermentation development and scale-up capabilities
- Enzyme formulation and bulk supply
- Metabolite synthesis, isolation and structural identification
- Gram to tonne manufacture of intermediates and active ingredients





selectAZyme™

Almac's biocatalysis expertise ranges from enzyme discovery, enzyme engineering and enzyme production to the synthesis of complex chiral intermediates and active ingredients, all based on selectAZyme™ technology. Challenge us with your chemistry problems and see how we can successfully deliver biocatalysis solutions and more...

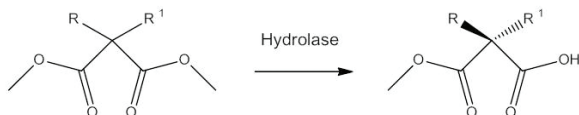
Almac has invested significantly in this area to develop robust enzymes with improved properties for chemical manufacturing.

We offer the following:

- Screening of our biocatalyst toolbox with customer substrates
- Biocatalytic route invention and process development
- Enzyme supply on a price per kilogram or activity basis
- Enzyme development and engineering
- Tech transfer and ongoing support through all the manufacturing steps, including the training of personnel, if required
- Supply of chiral intermediates
- Microbial screening and molecular biology for the development of novel biocatalysts
- Fermentation development and scale-up
- Metabolite synthesis
- FTE or FFS contracts

Case studies

Case study 1 - Desymmetrisation of diester using hydrolase enzymes

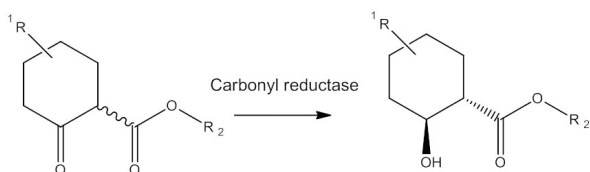


Client required development of a hydrolase mediated desymmetrisation process for tonne manufacture.

The Almac Solution involved:

- Enzyme screening and identification of AH125 enzyme
- Process optimisation and pilot scale demonstration
- Technology transfer back to customer site

Case study 2 - 200 kg chiral intermediate supply

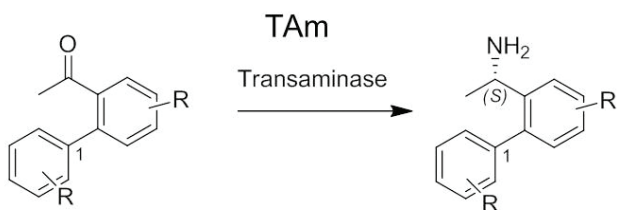


Client required supply of a chiral intermediate for chiral intermediate supply.

The Almac Solution involved:

- Re-design of a 5 step process involving a bioreduction step
- Chemistry controlled to yield >99.2 % ee and >98.5 % purity
- Enzyme screening and identification of AH161 using GDH as cofactor recycle enzyme

Case study 3 - Transaminase molecular modelling and chiral amine synthesis

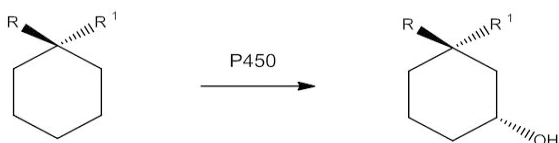


Client required access to a superior transaminase enzyme for delivery of 10 kg of chiral amine.

The Almac Solution involved:

- Computational biology used to access an active and selective transaminase enzyme
- Enzyme supply and transamination defined

Case study 4 - Enzyme supply and biooxidation scale-up



Client required P450 process optimised to yield a chiral alcohol with >10 g/L productivity.

The Almac Solution involved:

- P450 enzyme formulation and stability testing
- Process optimisation involving both enzyme supply and biotransformation
- Process demonstrated at 1 m³ scale with >12 g/L

Supporting Capabilities

Almac's technology platform can be applied throughout the product lifecycle to guide your synthesis projects from conception to scale-up.

Research

- Rational enzyme discovery and engineering
- **INSIGHT** metagenomics enzyme discovery
- Machine learning assisted enzyme discovery and engineering
- Directed evolution enzyme design
- Strain and pathway engineering
- New route design and consultancy

Process intensification and manufacture

- Ultrasound assisted biotransformation technology
- Integrated chemical manufacture of intermediates
- Bulk enzyme supply
- Chiral building block supply
- Enzyme immobilisation expertise

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