

AVINASH VELLORE SUNDER

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PROFESSIONAL SUMMARY:

Research scientist with demonstrated experience in enzymology, biocatalysis and structural biology. Worked in several collaborative research projects on metabolic engineering, bioprocess technology, quorum sensing and probiotics. Seeking to build a career in research and teaching in biochemistry, biotechnology, and microbiology.

EDUCATION:

Ph.D. Biotechnology 2017

CSIR-National Chemical Laboratory, Pune, India

Advisors: Dr. Archana Pundle and Dr. Sureshkumar Ramasamy

Dissertation: Penicillin V acylases from Gram-negative bacteria -
Biochemical and structural aspects

M.Sc. Biotechnology 2008

Bharathiar University, Coimbatore, India

First class with distinction, Gold Medal (82%)

B. Sc. Biotechnology 2006

Vellore Institute of Technology, Vellore, India

First class with distinction (86%)

SKILLS:

- Enzyme discovery and characterization, Enzyme engineering, Assay development, Biocatalysis process development
- Microbial cultivation and recombinant protein production in *E. coli* and cyanobacteria
- X-ray crystallography and protein structure characterization
- Strong communication and writing skills - Manuscript/report writing, editing and review

WORK EXPERIENCE:

Contractual Editor | Cactus Communications, Mumbai | June 2021-date

- Editing scientific manuscripts in biochemistry, molecular biology, microbiology and biotechnology
- Edited over 150 manuscripts for language, scientific accuracy, narrative flow, journal formatting

Postdoc Scientist | TU Darmstadt, Germany | Nov 2019- Mar 2021 |

- Worked on TRALAMINOL (Horizon 2020) project (with Prof. Wolf-Dieter Fessner)
- Developed a universal fluorimetric pH assay for high-throughput determination of enzyme activity
- Organic synthesis of hydroxyaldehydes as substrates for transketolase-mediated carboligation
- Generation and screening of variant libraries of transketolase to engineer improved enantioselectivity

Senior Project Research Scientist | IIT Bombay | Jun - Oct 2019 |

- Associated with DBT Pan-IIT Center for Bioenergy
- Developed engineered promoters to modulate recombinant protein expression in cyanobacteria
- Drafted project proposals on biocatalysis and metabolic engineering for industrial and DST/DBT funding

SERB National Postdoc Fellow | IIT Bombay | Jun 2017 - May 2019 |

- Independent funded N-PDF project (Mentor: Prof. Pramod Wangikar)
- Identified new nitrilase biocatalysts for the enantioselective production of carboxylic acids as bulk chemicals or pharmaceutical precursors
- Developed lab scale biocatalytic process for enantioselective reduction of ketones using recombinant carbonyl reductases in cyanobacteria and *E. coli*
- Assisted in development of cultivation protocols for enhanced production of enzymes and therapeutic proteins in shake flask and bioreactor

Project Assistant III | CSIR-NCL | Apr 2016 to Apr 2017 |

- Worked on CSIR-Fast track Translational project (Dr. Sureshkumar Ramasamy)
- Developed a biocatalytic process employing whole cells expressing penicillin V acylase immobilized on Lentikats hydrogels for industrial production of 6-aminopenicillanic acid

Ph. D. Research Project | CSIR-National Chemical Laboratory | 2009-15

- Characterized the kinetic and biochemical nature of highly active Penicillin V acylases from Gram-negative bacteria (*Pectobacterium atrosepticum* and *Agrobacterium tumefaciens*) cloned and expressed in *E. coli*.
- Delineated the structural differences between PVAs from Gram-positive and Gram-negative bacteria using protein crystallography and X-ray diffraction.
- Illustrated the significance of stacking interactions with tryptophan residues in the active site for substrate (pen V) binding and enhanced enzyme activity through site-directed mutagenesis.
- Revealed the ability of PVAs to degrade long chain acyl homoserine lactones (AHLs) involved in quorum sensing (*Collaboration with Prof. Wim Quax, University of Groningen, Netherlands*).
- Developed a whole cell system producing PVA for biotransformation of phenoxymethylpenicillin to 6-aminopenicillanic acid.

DST-DAAD Personnel Exchange program | TU Darmstadt | Nov 2011

- Worked on the project "Development of new Ntn-hydrolases for the efficient deracemization of drug precursors".

- Synthesized substituted phenylglycine compounds and tested several penicillin acylases for enantioselective resolution.

M. Sc. Internship | 2008 (Bharathiar University)

- Worked on the characterization of poly-hydroxyalkanoate (PHA) synthesis by novel bacterial isolates from landfill soil, for use in production of bio-degradable plastics.

Summer internship|2007 at Defence Institute of Physiology and Allied Sciences (DRDO- DIPAS), New Delhi

RESEARCH INTERESTS:

- Biocatalysis and enzyme engineering for sustainable chemistry
- Metabolic engineering of bacteria for production of biofuels, platform chemicals and biopolymers
- Structure function studies of enzymes involved in bacterial quorum sensing and stress response

RECOGNITIONS:

- Reviewer for *Preparative Biochemistry and Biotechnology Journal*
- DST SERB National Postdoctoral Fellowship Funding (2017-19), CSIR Research Fellowship for Ph.D. – JRF (2009-11) and SRF (2011-14)
- NCL-Research Foundation Award for Best Research in Biochemical Sciences, 2015 (CSIR-NCL)
- Supervised 10 M.Sc./B.Tech Interns for their final year dissertation projects.
- Conducted online training course and workshop on Research Manuscript Writing.
- Best Poster Award at Maharashtra Biotechnology Day Celebrations (Nov 14, 2015) at CSIR-NCL.

PUBLICATIONS: https://scholar.google.com/citations?hl=en&user=j9ZM1rEAAAAJ&view_op=list_works

- S.D. Ganjave, H. Dodia, A.V. Sunder, S. Madhu, P.P. Wangikar. High cell density cultivation of *E. coli* in shake flasks for the production of recombinant proteins. *Biotechnology Reports* (2022) 33: e00694
- A.M. Sawant, A.V. Sunder, V.K. Rao, S. Ramasamy, A. Pundle. Process development for 6-aminopenicillanic acid production using lentikats-encapsulated *Escherichia coli* cells expressing penicillin V acylase. *ACS Omega* (2020) 5: 28972-28976.
- P. Philem, Y. Yadav, A.V. Sunder, D. Ghosh, A. Prabhune, S. Ramasamy. Structural and enzymatic analysis of a dimeric cholyglycine hydrolase like acylase from *Shewanella loihica* active on *N*-acylhomoserine lactones. *Biochimie* (2020) 177: 108-116.
- A.V. Sunder, S. Shah, P. Rayavarapu, P.P. Wangikar. Expanding the repertoire of nitrilases with broad substrate specificity and high substrate tolerance for biocatalytic applications. *Process Biochemistry* (2020) 94: 289-296.
- S. Shah, A.V. Sunder, P. Singh, P.P. Wangikar. Characterization and application of a robust glucose dehydrogenase from *Paenibacillus pini* for cofactor regeneration in biocatalysis. *Indian J Microbiology* (2020) 60: 87-95.
- A. Sengupta, A.V. Sunder, S.V. Sohoni, P.P. Wangikar. Fine-tuning native promoters of *Synechococcus elongatus* PCC 7942 to develop synthetic toolbox for heterologous protein expression. *ACS Synthetic Biology* (2019) 8: 1219-1233.

- A. Sengupta, A.V. Sunder, S. Sohoni, P.P. Wangikar. The effect of CO₂ in enhancing photosynthetic cofactor recycling for alcohol dehydrogenase mediated chiral synthesis in cyanobacteria. *Journal of Biotechnology* (2019) 289:1-6.
- S. Shah, R. Agera, P. Sharma, A.V. Sunder, H. Bajwa, H.M. James, R.P. Gaikawai, P.P. Wangikar. Development of biotransformation process for asymmetric reduction with novel anti-Prelog NADH-dependent alcohol dehydrogenases. *Process Biochemistry* (2018) 70:71-78.
- D. Ghosh, S. Chougule, V.S. Avinash, S. Ramasamy. Evaluating a new high-throughput twin-arginine translocase assay in bacteria for therapeutic applications. *Current Microbiology* (2017) 74:1332-1336.
- D. Chand*, V.S. Avinash*, Y. Yadav, A.V. Pundle, C.G. Suresh, S. Ramasamy. Molecular features of bile salt hydrolases and relevance in human health – A review, *BBA General Subjects* (2017) 1861: 2981-2991. (**Equal contribution*)
- A.V. Sunder*, P.D. Utari*, S. Ramasamy, W.J. Quax, A.V. Pundle. Penicillin V acylases from Gram-negative bacteria degrade *N*-acylhomoserine lactones and attenuate virulence in *Pseudomonas aeruginosa*. *Applied Microbiology and Biotechnology* (2017) 101:2383-2395. (*Collaboration with University of Groningen*)
- V.S. Avinash, P. Chauhan, S. Gaikwad, A.V. Pundle. Biotransformation of penicillin V to 6-amino penicillanic acid using immobilized whole cells of *E. coli* expressing a highly active penicillin V acylase. *Preparative Biochemistry and Biotechnology* (2017) 47: 52-57.
- V.S. Avinash, S. Ramasamy, A.V. Pundle, C.G. Suresh. Penicillin acylases: Importance beyond their industrial utility. *Critical Reviews in Biotechnology*, 36 (2016) 303-316.
- V.S. Avinash, P. Panigrahi, C.G. Suresh, A.V. Pundle, S. Ramasamy. Structural analysis of a penicillin V acylase from *Pectobacterium atrosepticum* confirms the importance of two Trp residues for activity and specificity. *Journal of Structural Biology*, 193 (2016) 85-94.
- V.S. Avinash, S. Ramasamy, C.G. Suresh, A.V. Pundle. Penicillin V acylase from *Pectobacterium atrosepticum* shows high specific activity and unique kinetics. *International Journal of Biological Macromolecules*, 79 (2015) 1-7.
- V.S. Avinash*, P. Panigrahi*, C.G. Suresh, A.V. Pundle, S. Ramasamy, Structural modelling of substrate binding and inhibition in penicillin V acylase from *Pectobacterium atrosepticum*, *Biochemical Biophysical Research Communications*, 437 (2013) 538-43.
- V.S. Avinash, N. Naik, A. Kumar, A.V. Pundle, Characterization of a new *Bacillus cereus* ATUAVP1846 strain producing penicillin V acylase, and optimization of fermentation parameters, *Annals of Microbiology*, 62 (2012)1287-93.

BOOK CHAPTER:

- P.D. Philem, A.V. Sunder, S. Moirangthem. Role of quorum sensing signal acylhomoserine lactone in a phytobiome (2020) In: *Phytobiomes: Current Insights and future vistas*. Springer, Singapore, pp. 29-50.

PATENTS FILED:

- H.V. Mungi, P.V. Ghushie, V.S. Avinash, A.V. Pundle, “A probiotic composition comprising the novel isolated bacterial strain of *Brevibacterium casei* AP9”. US Patent 10058575B2 (2018)
- V.S. Avinash, A.V. Pundle, S. Ramasamy, “A recombinant penicillin V acylase and the process for preparation thereof”. Application WO/2015/151118

CONFERENCE PRESENTATIONS:

- Biotrans 2021 (Graz, Austria). Fluorescence-based pH assay for universal measurement of enzyme activity: Application in engineering the substrate scope of transketolase.
- Biotrans 2019 (Groningen, Netherlands). Development of broad spectrum nitrilase biocatalysts and processes for nitrile biotransformation.
- National Seminar on Crystallography 2013 (New Delhi, India). Structure of a penicillin V acylase from *Pectobacterium atrosepticum*.

MANUSCRIPTS UNDER PREPARATION:

- A.V. Sunder, M.L. Reif, A. Mertsch, W.D. Fessner (2022) Evaluation of fluorescence-based pH assay as a homogenous principle for measurement of enzyme activity: Application in transketolase engineering.

REFERENCES:

1. **Prof. Pramod Wangikar (N-PDF Mentor)**, Dept. of Chemical Engineering, IIT Bombay, Mumbai, India.
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2. **Dr. Archana Pundle (PhD supervisor)**, Chief Scientist (Retd.), Biochemical sciences division, CSIR-NCL, Pune, India. saroj.gulmohar@gmail.com
3. **Prof. Wolf-Dieter Fessner**, Institute of Organic Chemistry and Biochemistry, TU Darmstadt, Germany.
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