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With 10 years of career in the field of industrial biotechnology, I have developed expertise in the production of high value chemicals and biofuels from microbes by tinkering their genomes using metabolic engineering and genetic manipulation tools. The fast evolving metabolic engineering arena needed a thorough implementation of known tools and simultaneous integration of novel measures, in turn inculcating in-depth analytical and rational reasoning skills in me to maintain the time bound deliverables of the project goals. With these vital assets, I strongly believe in delivering results of highest standards and look forward to contribute as an individual and as a part of the team.

Research Experience: Projects and Grants as Investigator

Feb 2016 - present: DST-Young Scientist Fellow under Fast track scheme at SBT, JNU, Delhi.

Currently, I am principal investigator of the project entitled **"**Designing an engineered *Escherichia coli* host strain by identifying and modifying the regulatory controls of 3-hydroxy propanoic acid (3HP) pathway" at School of Biotechnology, JNU. 3-HP is an important platform chemical for acrylic acid and acrylamide. It was rated among the Top 10 value added chemicals from Biomass (US govt. DOE)**.**

In this project, I have introduced a novel 3HP production pathway in *E. coli* recruiting genes from two different microorganisms, *Clostridium butyricum* and *Lactobacillus reuteri*. The engineered strain successfully exhibited 3HP production at mini-bioreactor scale. Further, to achieve highest 3HP production, it is important to study the metabolic changes at gene level that limit its overproduction. Using transcriptomics data, differentially expressed genes were identified and subsequently, these key global regulators are being subjected to modulation so as to enable enhanced 3HP production at commercial scale.

On a parallel project, I worked on engineering a fungal strain for efficient production of cellulases using genome editing. A novel hyper cellulase producer fungi was isolated from soil. Genome sequencing of this *Trichoderma* sp was performed at the Ion Torrent PGM platform (ThermoFisher Scientific). Following annotation, genes encoding cellulases were identified as well as their regulatory regions. These regulatory regions possess the binding sites for transcriptions factors (TFs) that regulate cellulase genes expression. The binding sites of these TFs for a particular type of cellulase gene, cel3a, were chopped off from the genome using homologous recombination method. This ensured the elimination of binding of any TFs that would otherwise inhibit the expression of cellulases in the presence of glucose. We saw more than two-fold increase in cellulase production even in the presence of glucose. This approach can further serve as a platform for the development of constitute production of different kinds of cellulases.

Jan 2014 -Aug 2015: Co-PI under BIG Scheme project by DBT at TBI, South Campus, DU, Delhi.

I worked as a Co-PI for the project entitled "Synthetic Biology for overproduction of 2, 3 butanediol (BDO)" funded under DBT-BIRAC BIG Scheme, as a team of two. 2, 3-BDO is a key platform chemical for variety of industrial applications e.g. textiles, polymers and synthetic rubbers with a market of about $40bn per year. Classically, it is purified from petroleum by-products which make it expensive. We genetically altered a natural 2,3 BDO producer bacterium, *Paenibacillus polymyxa* sp by knocking in and out of selected genes which eliminated by-product formation and channelized the carbon flux towards 2,3 BDO production. Maximum volumetric productivity of 3.54 g/L/h and 0.48 g/g sugar yield was achieved under optimised conditions. The overproduction experiments with engineered strain were even demonstrated at 100L-200L scale at UDSC, Delhi. The technology is filed for patent and is currently under tech-transfer discussion with few companies for upscaling and manufacturing.

Details of completed and ongoing projects

S. No.	Title	Cost in lakhs	Duration	Role as PI/CoPI	Status	Funding agency
1.	Designing an engineered Escherichia coli host strain by identifying and modifying the regulatory controls of 3-hydroxy propanoic acid (3HP) pathway	37	3 years (February 2016 to January 2019)	**PI**: Responsible from complete conceptualization to implementation of the project	On-going	DST-SERB (GOI)
2.	Synthetic Biology for overproduction of 2, 3 butanediol (BDO)	50	18 months (January 2014 to June 2015)	**CoPI:** Research, validations, logistics, project management, grant writing,	Completed	BIG grant under BIRAC-DBT (GOI)

Research Experience: Doctoral and Post-Doctoral Research

July 2008- January 2014: PhD & Research Associate at Synthetic biology and biofuels group, ICGEB , New Delhi.

I have completed my PhD under the guidance of Dr. Syed Shams Yazdani, Group Leader, Synthetic Biology and Biofuel Group, ICGEB, New Delhi. During my PhD entitled "Engineering *Escherichia coli* for high level ethanol production", we developed an *E. coli* strain to produce high yield of ethanol, a biofuel candidate, by modulating the expression of various genes including promoter replacement and deleting pathways of competing co-products.

Though the *E. coli* can produce ethanol under anaerobic condition yet availability of limited reducing equivalence and generation of competing co-products undermine ethanol yield and productivity. During the doctoral project, I constructed an *E. coli* strain to produce high yield of ethanol from sugars by modulating the expression of pyruvate dehydrogenase operon under anaerobic condition after replacement of its promoter with the promoter of gapA gene and by deleting pathways for competing co-products such

as lactate, succinate, acetate and formate. Further, modulation of acetate kinase expression in the final strain regained cell growth rate and produced ethanol with 85% of theoretical yield.

The developed strain, one of its kind in country, lacks any foreign gene and is likely to be genetically more stable. Post PhD, we also focussed on maximizing industrial potential of developed strain by adoptive evolution to utilize waste materials as carbon source. The strain was tested for fermentation with lignocellulosic hydrolysate containing C5 and C6 sugars and similar yield and productivity of ethanol was achieved.

Short Term Research Assignments

- **June 2007-July 2008- Project Assistant- IGIB, Mall Road, New Delhi**
  - Worked under the project titled "Role of TNFα in induction of insulin resistance in hepatocytes and the mechanisms involved" with Dr. Malabika Datta.

- **January-April 2007- M. Sc Dissertation- NCCS, Pune**
  - M. Sc. project titled "Genetic localisation of the gene responsible for micro-opthalmic cataract in mice" under the guidance of Dr. Vasudevan Seshadri.

- **May-June 2007- M.Sc Summer Training, NII, New Delhi**
  - Summer training project titled "Isolation & Purification of NmpC porin from *E. coli* (ATCC 25922)" under the guidance of Dr. Kanwaljeet Kaur.

Educational Qualifications

Sl. No.	Course	University/Institution /Board	Year of Passing	Main Subjects Taken	Div. / Class & % Of Marks
1.	PhD Biotechnology	Synthetic Biology & Biofuels Group, ICGEB, N. Delhi-67	2014	Metabolic Engineering	Awarded
2.	PG (Diploma) Patent law	Nalsar, Hyderabad	2015	Intellectual property rights	A, 63.5%
3.	M.Sc Biotechnology	Dept of Biotechnology, University of Pune, Pune.	2007	Genetic engineering, Molecular biology, Virology, Microbiology	1st, 69%
4.	B.Sc (H) Biochemistry	Deshbandhu College, University of Delhi, Delhi.	2005	Molecular bio, Biostats, Metabolism, Cell bio, Genetics	1st, 72%
5.	Sr. Sec. School (12th)	CBSE, N. Delhi.	2002	Physics, Mathematics, English, Chemistry & Biology	1st, 83%
6.	Sec. School (10th)	CBSE, N. Delhi.	2000	Mathematics, English, Science, Social Studies, and Sanskrit	1st, 83%

List of Publication

- **Munjal N**, Javed K, Wajid S, Yazdani SS. *A constitutive expression system for cellulase secretion in Escherichia coli and its use in bioethanol production.* **PLoS ONE** 13-Mar-2015. DOI:10.1371/journal.pone.0119917 (Impact Factor 3.73).
- **Munjal N**, Mattam AJ, Pramanik D, Srivastava PS, Yazdani SS. *Modulation of endogenous pathways enhances bioethanol yield and productivity in Escherichia coli.* **Microbial Cell factories** 2012 Nov 4;11(1):145 (Impact Factor 4.52).
- Pandey AK, **Munjal N**, Datta M (2010) *Gene Expression Profiling and Network Analysis Reveals Lipid and Steroid Metabolism to be the most favored by TNFa in HepG2 cells*. **PLoS ONE** 2010 Feb 4;5(2):e9063. doi: 10.1371/journal.pone.0009063 (Impact Factor 3.73).

Manuscripts Under Preparation:

- **Whole Genome sequencing and annotation of a novel hypercellulytic *Trichoderma sp* and enhancing cellulolytic activity *by identifying and modulating gene regulatory regions of cellulolytic genes.*** Neha Munjal*, Sarfraz Akhtar and Krishna Jyoti Mukherjee.
- **Establishing a novel pathway for 3hydroxypropionic acid production in *E. coli* from glycerol with introducing a vitamin B12 coenzyme independent gene machinery.** Neha Munjal*, Neeraj Verma, Krishna Jyoti Mukherjee and Pawan K Dhar.

*First and corresponding author.

List of Patents

- "Microorganisms for enhanced production of 2,3 butanediol and uses thereof" Inventors: Nidhi Adlakha and Neha Munjal. Reference number: 3120/DEL/2014
- "Modified bacteria for the production of bioalchol" Syed Shams Yazdani, Neha Munjal and Anu Jose Mattam. International Patent reference: WO 2014033759 A4/PCT and Indian patent reference: IN2013/000535. **US Patent Granted** number US9631206 B2.

International Lectures and Presentations

Oral:

- Presented my work at the prestigious **Keystone Symposium** on 'Precision genome engineering and Synthetic Biology', Colorado, USA, March 2013.

  Conference proceedings as "Keystone Symposia Conference on Precision Genome Engineering and Synthetic Biology Brings Together Players from Both Disciplines". Matthew T. Weinstock. ACS Synth. Biol. 2013, 2, 296−300, were published where my research presentation was discussed.

Poster:

- Presented poster on 'Native pathway engineering in *E. coli* for production of bioethanol from pentose and hexose sugars' at '62nd Annual Meeting of the **Society for Industrial Microbiology and Biotechnology**' Washington DC, August 2012.
- Presented poster on 'Modulation of endogenous pathways enhances bioethanol yield and productivity in *Escherichia coli'* at '**Metabolic Engineering IX**' conference, Biarritz, France, June 2012.

Awards &Achievements

- Project Investigator for BIG grant on "Synthetic Biology for overproduction of 2, 3 butanediol (BDO)" funded by DBT-BIRAC (Govt. of India) July 2013.
- 2nd prize for poster presentation at 'IKMC: Global Innovation Exchange' at Hyderabad 2014.
- Oral presentation at the prestigious **Keystone Symposium** on Precision genome engineering and Synthetic Biology, Colorado, USA.
- Won 2nd prize as a team at ABLE-BEST 2011 (it is a national level Life Science Entrepreneurship Development program, launched by DBT- Ministry of Science and Technology, Govt. of India and managed by The Association for Biotechnology Led Enterprises, ABLE).
- Poster presentation: '**62nd Annual Meeting of the Society for Industrial Microbiology and Biotechnology' Washington DC and** at '**Metabolic Engineering IX**' conference, France.
- Awarded International Travel fellowships by DBT, DST and CSIR.
- **CSIR-JRF-NET December, 2007**.
- Participation in throw ball & member of organisation for 'BioFest', Inter University cultural programme at University of Pune (2006-07).
- Ranked 61 in All India **JNU Combined Entrance Examination for M.Sc Biotech and received scholarship by DBT, Govt. of India.**
- Participation & member of organisation for 'Science Day' celebration at Dept. of Biotechnology, University of Pune.
- Participation in throw ball & member of organisation for 'BioFest', Inter University cultural programme at University of Pune.
- Received awards for excellence in painting, extempore and debates competitions, 'Art of Expression' contest by Parker.

References

1:

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