Prof. J. Gowrishankar

Prof J Gowrishankar, MBBS, PhD
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Academic qualifications

M.B.B.S., 1979: Christian Medical College, Vellore (University of Madras), India.
Ph.D., 1983: University of Melbourne (Australia).

Previous academic / scientific positions held

1983 – 2000 : Scientist, Centre for Cellular & Molecular Biology, Hyderabad 500 007, India.

2000 – 2016 : Staff Scientist, Laboratory of Bacterial Genetics, Centre for DNA Fingerprinting & Diagnostics, Hyderabad, India.

2005 – 2015 : Director, Centre for DNA Fingerprinting & Diagnostics, Hyderabad, India.

2014 – 2016 : Director, National Institute of Animal Biotechnology, Hyderabad, India (additional charge).

2007 – 2017 : J C Bose National Fellow, Laboratory of Bacterial Genetics, Centre for DNA Fingerprinting & Diagnostics, Hyderabad, India.

2017 – 2019 : INSA Senior Scientist, Laboratory of Bacterial Genetics, Centre for DNA Fingerprinting & Diagnostics, Hyderabad, India.

2019 – 2024 : Director, Indian Institute of Science Education and Research, Mohali, India.

Research Focus

The broad theme of Prof Gowrishankar's research has been on use of the "genetic approach" (that is, involving the comparative study of mutants or variants) to understand, at both molecular and organismal levels, various fundamental life processes in the model bacterium *Escherichia coli*. The topics of his group's research include osmoregulation, solute transport, RNA processing and turnover, maintenance of genome integrity, and interplay within the "central dogma" triumvirate of transcription, translation and DNA replication.

Awards and Recognitions

Prof Gowrishankar is an elected Fellow of the Indian National Science Academy (INSA), Indian Academy of Sciences, National Academy of Sciences (India), and Telangana Academy of Sciences.

He has been the recipient of Young Scientist awards of INSA and CSIR, BM Birla Prize, Shanti Swarup Bhatnagar Prize, FICCI Award, CSIR Technology Prize, New Millennium Medal of Indian Science Congress, Shri Om Prakash Bhasin Award, Andhra Pradesh Scientist Award, J C Bose National Fellowship, Moselio Schaechter Award of the American Society for Microbiology, and INSA Senior Scientist award. In 2013, Prof Gowrishankar was conferred the Padma Shri award by the Government of India.

Selected Publications

1. Gowrishankar, J. 1985. Identification of osmoresponsive genes in *Escherichia coli*: evidence for participation of potassium and proline transport systems in osmoregulation. Journal of Bacteriology **164**:434-445.

2. Gowrishankar, J., P. Jayashree, and K. Rajkumari. 1986. Molecular cloning of an osmoregulatory locus in *Escherichia coli*: increased *proU* gene dosage results in enhanced osmotolerance. Journal of Bacteriology **168**:1197-1204.

3. Gowrishankar, J. 1989. Nucleotide sequence of the osmoregulatory *proU* operon of *Escherichia coli*. Journal of Bacteriology **171**:1923-1931.

4. Dattananda, C. S., K. Rajkumari, and J. Gowrishankar. 1991. Multiple mechanisms contribute to osmotic inducibility of *proU* operon expression in *Escherichia coli*: demonstration of two osmoresponsive promoters and of a negative regulatory element within the first structural gene. Journal of Bacteriology **173**:7481-7490.

5. Asha, H., and J. Gowrishankar. 1993. Regulation of *kdp* operon expression in *Escherichia coli*: evidence against turgor as signal for transcriptional control. Journal of Bacteriology **175**:4528-4537.

6. Manna, D., and J. Gowrishankar. 1994. Evidence for involvement of proteins HU and RpoS in transcription of the osmoresponsive *proU* operon in *Escherichia coli*. Journal of Bacteriology **176**:5378-5384.

7. Gowrishankar, J., and D. Manna. 1996. How is osmotic regulation of transcription of the *Escherichia coli proU* operon achieved? A review and a model. Genetica **97**:363-378.

8. Reddy, M., and J. Gowrishankar. 1997. Identification and characterization of *ssb* and *uup* mutants with increased frequency of precise excision of transposon Tn*10* derivatives: nucleotide sequence of *uup* in *Escherichia coli*. Journal of Bacteriology **179**:2892-2899.

9. Bhandari, P., and J. Gowrishankar. 1997. An *Escherichia coli* host strain useful for efficient overproduction of cloned gene products with NaCl as the inducer. Journal of Bacteriology **179**:4403-4406.

10. Reddy, M., and J. Gowrishankar. 1997. A genetic strategy to demonstrate the occurrence of spontaneous mutations in nondividing cells within colonies of *Escherichia coli*. Genetics **147**:991-1001.

11. Sardesai, A. A., and J. Gowrishankar. 2001. *trans*-Acting mutations in loci other than *kdpDE* that

affect *kdp* operon regulation in *Escherichia coli*: effects of cytoplasmic thiol oxidation status and nucleoid protein H-NS on *kdp* expression. Journal of Bacteriology **183**:86-93.

12. SaiSree, L., M. Reddy, and J. Gowrishankar. 2001. IS*186* insertion at a hot spot in the *lon* promoter as a basis for Lon protease deficiency of *Escherichia coli* B: identification of a consensus target sequence for IS*186* transposition. Journal of Bacteriology **183**:6943-6946.

13. Rajkumari, K., and J. Gowrishankar. 2002. An N-terminally truncated RpoS (σ^S) protein in *Escherichia coli* is active in vivo and exhibits normal environmental regulation even in the absence of *rpoS* transcriptional and translational control signals. Journal of Bacteriology **184**:3167-3175.

14. Harinarayanan, R., and J. Gowrishankar. 2003. Host factor titration by chromosomal R-loops as a mechanism for runaway plasmid replication in transcription termination-defective mutants of *Escherichia coli*. Journal of Molecular Biology **332**:31-46.

15. Bharatan, S. M., M. Reddy, and J. Gowrishankar. 2004. Distinct signatures for mutator sensitivity of *lacZ* reversions and for the spectrum of *lacI/lacO* forward mutations on the chromosome of nondividing *Escherichia coli*. Genetics **166**:681-692.

16. Harinarayanan, R., and J. Gowrishankar. 2004. A *dnaC* mutation in *Escherichia coli* that affects copy number of ColE1-like plasmids and the PriA-PriB (but not Rep-PriC) pathway of chromosomal replication restart. Genetics **166**:1165-1176.

17. Nandineni, M. R., and J. Gowrishankar. 2004. Evidence for an arginine exporter encoded by *yggA* (*argO*) that is regulated by the LysR-type transcriptional regulator ArgP in *Escherichia coli*. Journal of Bacteriology **186**:3539-3546.

18. Gowrishankar, J., and R. Harinarayanan. 2004. Why is transcription coupled to translation in bacteria? Molecular Microbiology 54:598-603.

19. Laishram, R. S., and J. Gowrishankar. 2007. Environmental regulation operating at the promoter clearance step of bacterial transcription. Genes and Development 21:1258-1272.

20. Saxena, S., and J. Gowrishankar. 2011. Modulation of Rho-dependent transcription termination in *Escherichia coli* by the H-NS family of proteins. Journal of Bacteriology 193:3832-3841.

21. Anupama, K., J. K. Leela, and J. Gowrishankar. 2011. Two pathways for RNase E action in *Escherichia coli in vivo* and bypass of its essentiality in mutants defective for Rho-dependent transcription termination. Molecular Microbiology 82:1330-1348.

22. Marbaniang, C. N., and J. Gowrishankar. 2012. Transcriptional cross-regulation between Gram-negative and Gram-positive bacteria, demonstrated using ArgP-argO of *Escherichia coli* and LysG-lysE of *Corynebacterium glutamicum*. Journal of Bacteriology 194:5657-5666.

23. Leela, J. K., A. H. Syeda, K. Anupama, and J. Gowrishankar. 2013. Rho-dependent transcription termination is essential to prevent excessive genome-wide R-loops in *Escherichia coli*. Proceedings of the National Academy of Sciences USA 110:258-263.

24. Gowrishankar, J. 2015. End of the beginning: elongation and termination features of alternative modes of chromosomal replication initiation in bacteria. PLoS Genetics 11:e1004909.

25. Raghunathan, N., R. M. Kapshikar, J. K. Leela, J. Mallikarjun, P. Bouloc, and J. Gowrishankar. 2018. Genome-wide relationship between R-loop formation and antisense transcription in *Escherichia coli*. Nucleic Acids Research 46:3400-3411.

26. Kapshikar, R.M. and J. Gowrishankar. 2019. Direct inhibition of transcription in vitro by the isolated N-terminal domain of the *Escherichia coli* nucleoid protein H-NS and by its paralogue Hha. Microbiology 165:463-474.

27. Raghunathan, N., S. Goswami, J. K. Leela, A. Pandiyan, and J. Gowrishankar. 2019. A new role for *Escherichia coli* Dam DNA methylase in prevention of aberrant chromosomal replication. Nucleic Acids Research 47:5698-5711.

28. Ali, N. and J. Gowrishankar. 2019. Cross-subunit catalysis and a new phenomenon of recessive resurrection in *Escherichia coli* RNase E. Nucleic Acids Research DOI:10.1093/nar/gkz1152.

29. Leela, J. K., N. R. Raghunathan, and J. Gowrishankar. 2021. Topoisomerase I essentiality, DnaA-independent chromosomal replication, and transcription-replication conflict in *Escherichia coli*. Journal of Bacteriology 203:e00195-21.

30. Mallikarjun, J., L. SaiSree, P. Himabindu, K. Anupama, M. Reddy, and J. Gowrishankar. 2022. Modulation of RecFORQ- and RecA-mediated homologous recombination in *Escherichia coli* by isoforms of translation initiation factor IF2. Journal of Bacteriology 204:e00569-21.

31. Mallikarjun, J. and J. Gowrishankar. 2022. Essential role for an isoform of *Escherichia coli* translation initiation factor IF2 in repair of two-ended DNA double-strand breaks. Journal of Bacteriology 204:e00571-21.

32. Goswami, S. and J. Gowrishankar. 2022. Role for DNA double strand end-resection activity of RecBCD in control of aberrant chromosomal replication initiation in *Escherichia coli*. Nucleic Acids Research 50:8643-8657.

33. Pandiyan, A., J. Mallikarjun, H. Maheshwari, and J. Gowrishankar. 2024. Pathological R-loops in bacteria from engineered expression of endogenous antisense RNAs whose synthesis is ordinarily terminated by Rho. Nucleic Acids Research **52**:12438-12455.

34. Basak, P., M. Ekka, A. Pandiyan, S. Tandon, and J. Gowrishankar. 2025. The membrane-targeting-sequence motif is required for exhibition of recessive resurrection in *Escherichia coli* RNase E. Nucleic Acids Research **53**(3):gkaf055 (https://doi.org/10.1093/nar/gkaf055).

Patents

1. Gowrishankar, J., P. Bhandari, and K. Rajkumari. 1998. US Patent 5830690. Process for producing polypeptides.

2. J. Gowrishankar, J., M. Reddy, and S.M. Bharatan. 1999. US Patent 5981191. Process for identifying mutagens and antimutagens.

3. Gowrishankar, J., and R. Harinarayanan. 2007. US Patents 7176028 B2 and 7220588 B2. A method of altering levels of plasmids.

4. Gowrishankar, J., and M. R. Nandineni. 2010. US Patent 7749738 B2. A microbial process for arginine production.

5. Gowrishankar, J., and T. S. Shaffiqu. 2020. Indian Patent 330309. Treatment of hides or skins for leather manufacture.