

## RAM KARAN, Ph.D.

Associate Professor



Department of Microbiology, University of Delhi South Campus, Delhi, India

Phone: +91-9560572529, E-mail: [ramkaran@south.du.ac.in](mailto:ramkaran@south.du.ac.in), [karaniit@gmail.com](mailto:karaniit@gmail.com)

### PROFESSIONAL SUMMARY

- 12 years of international experience after my Ph.D. from the premium Institute, IIT Delhi
- Three patents/applications, 51 publications in highly reputed international journals and conferences
- Google citations 1494, h-index 20, i10-index 26, 17 GenBank submissions
- Involved in writing more than \$5M of funding from NASA, NIH, NSF, BMGF, and KAUST
- Mentored 12 visiting students and research interns, six masters, and three Ph.D. students
- Received several international (India, USA, Italy, Japan, Saudi Arabia) honors, awards, and fellowships
- International collaboration in the USA, UK, Germany, Taiwan, South Korea, Saudi Arabia, and India

### EDUCATION

2021	Higher Education Teaching Certificate, Harvard University, Cambridge, Massachusetts, USA
2011	Doctorate in Applied Microbiology and Biochemistry (Ph.D.), Indian Institute of Technology (IIT), Delhi, India
2005	M.Sc. Bioorganic Chemistry, Meerut University, Meerut, India
2003	M.Sc. Physical Chemistry, Meerut University, Meerut, India
2001	B.Sc. Biochemistry, Meerut University, Meerut, India

### EXPERIENCE

2021–2023	Senior Research Scientist, King Abdullah University of Science and Technology, Saudi Arabia
2018–2021	Research Scientist, King Abdullah University of Science and Technology, Saudi Arabia
2015–2018	Senior Research Fellow, King Abdullah University of Science and Technology, Saudi Arabia
2014–2015	Research Fellow, Uniformed Services University, NIH Campus, Bethesda, Maryland, USA
2011–2014	American Society of Microbiology (ASM) Fellow, University of Maryland, Maryland, USA

### VISITING PROFESSORSHIP

2020–present	CCS, Meerut University, Meerut, India
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### TEACHING EXPERIENCE

2012–2023	Seminars, training, mentoring, University of Maryland, USA and KAUST, Saudi Arabia
2011	Lecturer, Department of Biotechnology, Amity University, Noida, UP, India
2007–2010	Teaching Assistant, Indian Institute of Technology (IIT), Delhi, India
2003–2004	Tutor, JV College, CCS Meerut University, Meerut, India

### PROFESSIONAL DEVELOPMENT COURSES & WORKSHOPS

- Patenting in Biotechnology, Technical University of Denmark (DTU), Lyngby, Denmark
- Technology Entrepreneurship: Lab to Market, Harvard University, Cambridge, MA, USA
- Professional Certificate: Fundamentals of Project Management, University of Adelaide, Australia
- Exercising Leadership: Foundational Principles, Harvard University, Cambridge, MA, USA
- Grant writing, Managing conflict, Mentoring, Lancaster University, UK

### HONORS, AWARDS & FELLOWSHIPS

- Outstanding contribution award, 2023, and excellence recognition award, 2021, KAUST, Saudi Arabia
- Young Scientist Award (YSA) by the Society for Biotechnology, Japan, in “Thermophiles 2019” Japan
- Best paper and best presentation award by International Society of Extremophiles (ISE) and Springer in “Extremophiles 2018” Naples, Italy
- American Society for Microbiology (ASM) International Fellowship for Asia, 2011
- Award for publishing high-impact factor research papers by IIT, Delhi, India, 2011
- Research fellowship (2005-2011) and international travel award, 2010 by CSIR, Department of Biotechnology (DBT), Department of Science and Technology (DST), MHRD, Government of India

## MEMBERSHIP IN PROFESSIONAL SOCIETIES

- Member, American Society of Microbiology (ASM), USA
- Life member, Biotech Research Society of India (BRSI)
- Life member, Asian Federation of Biotechnology (AFOB)

## ASSOCIATE/GUEST EDITOR OF INTERNATIONAL JOURNALS

1. Environmental Sustainability, 2. Microbial Biotechnology, 3. International Journal of Microbiology and Biotechnology, 4. Frontiers in Microbiology

## PATENTS

1. Capturing and converting CO<sub>2</sub> into biodegradable bioplastic (United States patent and trademark office (USPTO), WO/2019/193518, international application no. PCT/IB2019/052735
2. Air-loaded vesicle nanoparticles promote cell growth in 3D bioprinted tissue constructs, WO 2022/049494 A1, international application no. PCT/IB2021/057973.
3. Vaccination by heterologous boost immunization, WO-2022/115471-A1.

## PUBLICATIONS (International Journals)

1. **R. Karan\***, D. Renn, S. Nozue, L. Zhao, S. Habuchi, T. Allers, M. Rueping (2023) Bioengineering of air-filled protein nanoparticles by genetic and chemical functionalization. **J. Nanobiotechnology** 21(1):108. \*Corresponding author.
2. S. Alshehri<sup>∞</sup>, **R. Karan**<sup>∞</sup>, S. Ghalayini, K. Kahin<sup>1</sup>, Z. Khan, D. Renn, S. Mathew, M. Rueping, C.A.E. Hauser (2022) Air-loaded gas vesicle nanoparticles promote cell growth in 3D bioprinted tissue constructs. **Int. J. Bioprint.** 8(3):489. <sup>∞</sup>contributed equally.
3. M. Sysoev, S.W. Grötzinger, D. Renn, J. Eppinger, M. Rueping, **R. Karan\*** (2021) Bioprospecting of novel extremozymes from prokaryotes – The advent of culture-independent methods. **Front. Microbiol.** 12: 630013 (**highly accessed**). \*Corresponding author.
4. D. Renn, L. Shepard, A. Vancea, **R. Karan**, S.T. Arold, M. Rueping (2021) Novel enzymes from the Red Sea brine pools: Current state and potential Frontiers in Microbiology. **Front. Microbiol.** 12: 732856.
5. **R. Karan\***, Sam Mathew, Reyhan Muhammad, Didier B. Bautista, Malvina Vogler, Jörg Eppinger, Romina Oliva, Luigi Cavallo, Stefan T. Arold, Magnus Rueping (2020) Understanding high-salt and cold adaptation of a polyextremophilic enzyme. **Microorganisms** 8(10), 1594 (**highly accessed**). \*Corresponding author
6. M. Voglar<sup>∞</sup>, **R. Karan**<sup>∞\*</sup>, D. Renn, Groll, A. Vancea, M. Vielberg, S.W. Grötzinger, P. DasSarma, S. DasSarma, J. Eppinger, M. Groll, M. Rueping (2020) Crystal structure and function of carbonic anhydrase from Red sea brine pools. **Front. Microbiol.** 11: 742. <sup>∞</sup>contributed equally \*Corresponding author.
7. A. Hohl<sup>∞</sup>, **R. Karan**<sup>∞</sup>, A. Akal, D. Renn, X. Liu, A. Dharmarajnadar, S. Ghorpade, M. Groll, J. Eppinger, M. Rueping (2019) Engineering a promiscuous pyrrolysyl-tRNA synthetase by a high throughput FACS screen. **Nature Sci. Rep.** 9(1):11971 <sup>∞</sup>contributed equally \*Corresponding author.
8. A. Hohl, Y. G Mideksa, **R. Karan**, et al. (2019) Genetically encoded biotin analogs: Incorporation and application in bacterial and mammalian cells. **ChemBioChem** 20(14):1795-1798.
9. A.L. Akal, **R. Karan**, A. Hohl, I. Alam, M. Vogler, S.W. Grötzinger, J. Eppinger, M. Rueping (2019) A polyextremophilic alcohol dehydrogenase from the Atlantis II Deep Red Sea brine pool. **FEBS Open Bio.** 9(2): 194–205 (**Featured article on the cover page of the journal**).
10. I.S. Al-Rowaihi, A. Paillier, S. Rasul, **R. Karan**, R. Laamarti, S.W. Grötzinger, K. Takanaabe, J. Eppinger (2018) Poly(3-hydroxybutyrate) production in an integrated electromicrobial setup: Investigation under stress-inducing conditions. **PLoS One.** 13(4): e0196079.
11. I.S. Al-Rowaihi<sup>1</sup>, B. Kick, S.W. Grötzinger, C. Burger, **R. Karan**, D. Weuster-Botz, S.T. Arold, J. Eppinger (2018) A two-stage biological gas to liquid transfer process to convert carbon dioxide into bioplastic. **Bioresour. Technol. Rep.** 1, 61-68.
12. S.W. Grötzinger, **R. Karan**, E. Strillinger, S. Bader, A. Frank et al. (2017) Identification and experimental characterization of an extremophilic brine pool alcohol dehydrogenase from single amplified genomes. **A.C.S. Chem. Biol.** 13(1): 161-170.
13. V.J. Laye, **R. Karan**, J.M. Kim, W.T. Pecher, P. DasSarma, S. DasSarma (2017) Key amino acid residues conferring enhanced enzyme activity at cold temperatures in an Antarctic polyextremophilic β-galactosidase. **Proc. Natl. Acad. Sci. U.S.A.** 114(47):12530-12535.

14. A.U. Andar<sup>∞</sup>, **R. Karan**<sup>∞</sup>, W.T. Pecher, P. DasSarma, W.D. Hedrich, A.L. Stinchcomb, S. DasSarma (2017) Microneedle-Assisted Skin Permeation by Non-toxic Bioengineerable Gas Vesicle Nanoparticles. **A.C.S. Mol. Pharm.** 14(3):953-958. <sup>∞</sup>contributed equally.
15. W.T. Pecher, J-M Kim, P. DasSarma, **R. Karan**, P. Sinnis, S. DasSarma (2016) *Halobacterium* expression system for production of full-length *Plasmodium falciparum* protein. **Biotech. Extrem.** 699-709.
16. S DasSarma, P DasSarma, W Pecher, **R Karan**, JM Kim (2016) Gas vesicle nanoparticles: Composition, biogenesis, and therapeutic applications. **Protein Science** 25, 55-56.
17. **R. Karan**, P. DasSarma, E. Balcer-Kubiczek, R.R. Weng, C. Liao, W.V. Ng, S. DasSarma (2014) Bioengineering radioresistance by overproduction of R.P.A., a mammalian-type single-stranded DNA-binding protein, in a halophilic archaeon. **Appl. Microbiol. Biotechnol.** 98(4):1737-1747.
18. P. DasSarma, V.D. Negi, A. Balakrishnan, **R. Karan**, S. Barnes, F. Ekulona, D. Chakravorty, S. DasSarma (2014) Haloarchaeal gas vesicle nanoparticles displaying *Salmonella* SopB antigen reduce bacterial burden when administered with live attenuated bacteria. **Vaccine.** 32(35):4543-4549.
19. S. DasSarma, **R. Karan**, P. DasSarma, S. Barnes, F. Ekulona, B. Smith (2013) An improved genetic system for bioengineering buoyant gas vesicle nanoparticles from Haloarchaea. **B.M.C. Biotechnol.** 13:112 (**highly accessed**).
20. **R. Karan**, M.D. Capes, P. DasSarma, S. DasSarma (2013) Cloning, overexpression, purification, and characterization of a polyextremophilic  $\beta$ -galactosidase from the Antarctic haloarchaeon *Halorubrum lacusprofundi*. **B.M.C. Biotechnol.** 13:3 (**highly accessed**).
21. S. DasSarma, M.D. Capes, **R. Karan**, P. DasSarma (2013) Amino acid substitutions in cold-adapted proteins from *Halorubrum lacusprofundi*, an extremely halophilic microbe from antarctica. **PLoS One.** 8(3):e58587.
22. **R. Karan**, M.D. Capes, S. DasSarma (2012) Function and biotechnology of extremophilic enzymes in low water activity. **Aquat. Biosyst.** 8(1):4 (**highly accessed**).
23. S. Kumar, **R. Karan**, S. Kapoor, S.P. Singh, S.K. Khare (2012) Screening and isolation of halophilic bacteria producing industrially important enzymes. **Braz. J. Microbiol.** vol.43 no.4 (**highly accessed**).
24. **R. Karan**, S. Kumar, R. Sinha, S.K. Khare (2012) Haolphilic microorganisms as sources of novel enzymes, in Microbes in environmental management and biotechnology. Microorganisms in Sustainable Agriculture and Biotechnology. **Springer**, pp 555-579.
25. **R. Karan** and S.K. Khare (2011) Stability of haloalkaliphilic *Geomicrobium* sp. protease modulated by salt. **Biochemistry (Moscow).** 76 (6) 686-693.
26. **R. Karan**, R.K.M. Singh, S. Kapoor, S.K. Khare (2011) Gene identification and molecular characterization of solvent stable protease from a moderately haloalkaliphilic bacterium *Geomicrobium* sp. **EMB2. J Microbiol. Biotechnol.** 21, 129-135 (**Featured article on the cover page of the journal**).
27. R. Sinha, **R. Karan**, A. Sinha, S.K. Khare (2011) Interaction and nanotoxic effect of ZnO and Ag nanoparticles on mesophilic and halophilic bacterial cells. **Bioresource Technol.** 102, 1516-20.
28. **R. Karan**, S.P. Singh, S. Kapoor, S.K. Khare (2011) A novel organic solvent tolerant protease from a newly isolated *Geomicrobium* sp. EMB2 (MTCC 10310): Production optimization by response surface methodology. **N. Biotechnol.** 28, 136-145.
29. **R. Karan** and S.K. Khare (2010) Purification and characterization of a solvent stable protease from *Geomicrobium* sp. EMB2. Special issue on "Extremophiles: a source of innovation for industrial and environmental applications" **Environ. Technol.** 10, 1061-1072.
30. Sumit Kumar, **R. Karan**, S.K. Khare (2009) Solvent-tolerant microorganisms: an emerging source of novel enzymes. **Biotech. International.** 21: 6-8.

#### National Journal

31. R. Khurana **R. Karan**, A. Kumar, S.K. Khare (2010) Antioxidant and antimicrobial activities in some Indian herbal plants: Protective effect against free radical-mediated D.N.A. damage. **J. Plant. Bioch. Biotech.** 19(2), 229-233.

#### Under submission

32. **R. Karan\***, D. Renn, T. Allers, M. Rueping (2023) Systematic screening of purification tags in haloarchaeal expression system. **Microb. Cell Factories** \*Corresponding author.
33. D. Renn, L. Shepard, **R. Karan\***, M. Rueping (2023) Tailored design of gas vesicle nanoparticles: Opportunities and Challenges. **Front. Bioeng. Biotechnol.** \*Corresponding author.

34. **R. Karan\***, T. Allers, M. Rueping (2023) Proteosome and haloaraceal expression system. **Protein Science**  
\*Corresponding author.

#### **PROCEEDINGS/INTERNATIONAL CONFERENCES**

35. **R. Karan** et al. (2022) Extremophiles: Superheroes of sustainability and link between Earth and astrobiology. International Conference on Environmental Sustainability & Biotechnology: Opportunities & Challenges (ICESB22, 16-20 Nov.), **Goa, India**.
36. **R. Karan** et al. (2022) Poly-extreme environments: promising sources of novel enzymes for sustainability. Extremophiles2022 (18-22 Sep.), **Loutraki, Greece**.
37. **R. Karan** et al. (2022) Polyextremophilic enzymes from Red Sea Brine Pools and Deep Lake of Antarctica. Halophiles2022 (26-29 June), **Alicante, Spain**.
38. **R. Karan** (2021) Living on other planets: What would it be like? International Virtual Conference on “Living with Ecological Prosperity: lifestyle, Economy, Environment and Sustainability” the **University of Delhi, Delhi**, India, in association with the Department of Botany, MLS University, Udaipur, Rajasthan, India, and Young Social Scientists Association of India on 10-11 July 2021.
39. **R. Karan** (2020) Extremophiles: Superheroes of Tomorrow. International Conference on Recent Trends in Advancement of Mathematical and Physical Sciences, organized by Deva Nagri College, Meerut (C.C.S. University, Meerut), **Uttar Pradesh, India** on 22-23 May 2020 (Invited Talk-Lead speaker).
40. **R. Karan** et al. (2019) Extremophiles and extremozymes: Biotechnology and engineering stress tolerance. GINMA2019 (6-8 Nov), **Hisar, India** (Invited Talk-Lead speaker).
41. **R. Karan** et al. (2019) Halo-thermophilic Brine Pool Extremozymes from Single Amplified Genomes. Thermophiles2019 (02-06 Sep), **Fukuoka, Japan**. \*Won Young Scientist Award.
42. **R. Karan** et al. (2019) Single amplified genomes from Red Sea brine pool extremophiles - a source of novel enzymes. Halophiles2019 (22-28 June), **Cluj-Napoca, Romania**.
43. **R. Karan** et al. (2018) Identification, expression, purification, and characterization of Red Sea brine pools extremozymes from single amplified genomes. Extremophiles2018 (16-20 Sep 2018), **Naples, Italy**. \*Won the best research and best presentation award.
44. **R. Karan** et al. (2016) Bioengineering novel floating nanoparticles for protein and drug delivery. **Materials Today: Proceedings** 3(2) 206-210.
45. **R. Karan** et al. (2015) Haloarchaeal gas vesicle nanoparticles displaying *Salmonella* antigens as a novel approach to vaccine development. **Procedia in Vaccinology** Volume 9, Pages 16–23.
46. **R. Karan** et al. (2013) Understanding protein function and adaptation in haloarchaea through bioinformatic and experimental approaches. **Halophiles 2013** (23-27 June), University of Connecticut Storrs, **CT, USA**.
47. **R. Karan** et al (2012) Molecular mechanisms of radiation tolerance of Haloarchaea: A case for panspermia? Astrobiology Science Conference 2012 (16-20 April), Exploring Life: Past and Present, Near and Far. Organized by **NASA in Atlanta, Georgia**.
48. **R. Karan** and S.K. Khare (2010) Molecular characterization of a solvent stable protease from a moderately haloalkaliphilic *Geomicrobium* sp. EMB2. Halophiles2010 (29 June-03 July) **Beijing, China**.
49. **R. Karan** et al. (2008) Extracellular alkaline amylase from a haloalkaliphilic bacterium isolated from Sambhar Lake, Rajasthan: Production and optimization. International Symposium on Microbial Biotechnology: Diversity, Genomics, and Metagenomics, 18-20 Nov 2008, **Delhi, India**.
50. **R. Karan** and S.K. Khare (2006) Enzymatic diversity among halophilic bacteria isolated from the seacoast of Saurashtra. Society of Biological Chemists (India), 8-11 December 2006 at **JNU, New Delhi**.

#### **PEER REVIEW SERVICE**

**Review editor:** Frontiers in Bioengineering and Biotechnology, Extremophiles, Process Biochemistry, FEMS Microbiology, International Journal of Applied Sciences and Biotechnology, Preparative Biochemistry and Biotechnology, Enzyme Engineering, Evidence-Based Complementary and Alternative Medicine, National Academy Science Letters, Basic Microbiology, 3Biotech, Catalysis, Microorganism, Fermentation, Journal of Microbiology, Environmental Microbiology, Frontiers in Environmental Science, Applied Microbiology and Biotechnology, Biomass Conversion and Biorefinery, Bioprocess Engineering, Cells