Abhilash Vijay Nair

Date of birth: 26/08/1994 **Nationality:** Indian

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ResearchGate: https://www.researchgate.net/profile/Abhilash-Nair-22

SCIENCE, MY JOURNEY AND BEYOND

I am a Senior Research Fellow with more than 5 years of research experience in the field of Microbiology and Host-pathogen interaction. During my doctoral research training, I collaborated with Prof. Nagasuma Chandra (IISc Bangalore), Dr. Debasis Das (IISc Bangalore), Dr. LN Rao (IISc Bangalore), Dr. Amit Lahiri (CDRI, India) and Prof. Anne Blanc Pottard, University of Montpellier, where my experimental expertise has taken the science to a newer level. I dealt with various pathogens, such as *Salmonella* and the ESKAPE group, and investigated their mechanistic strategies to survive under hostile conditions, evasion of the host immune system and the bacteria-led modulations of the host cellular and metabolic machinery. My goal is to acquire greater professional knowledge, learn from a team of professionals and be able to translate that knowledge further, when necessary, in terms of capacity building. I am enthusiastic about working towards advancement in the areas of molecular biology, cell biology and immunology in metabolic disease and infectious diseases

EDUCATION AND TRAINING

- 01/08/2018 Bangalore, India

  DOCTOR OF PHILOSOPHY (PHD)- Indian Institute of Science, Bangalore

  Principal Investigator: Prof. Dipshikha Chakravortty

  Affiliation: Department of Microbiology and Cell Biology

  Field of study: Host-pathogen interaction, Microbiology, Biochemistry, Cell Biology, Infection Biology

  Final grade: Ph.D Coursework grade: 9.0/10

  Thesis: Deciphering the role of spermidine in *Salmonella* Typhimurium pathogenesis

  Website: https://mcb.iisc.ac.in/dclab/

I have developed and emerged as an independent scientist by formulating projects, gaining technical expertise and gaining undergraduate students during my doctoral training. For the fulfilment of my doctoral thesis, I have performed numerous experimental methodologies:

Microbiology, Molecular Biology and related techniques

I have gained knowledge and performed numerous microbiology biology-related methodologies such as bacterial isolation technique, colony-forming unit enumeration, and spread plating, to name a few. Further, I have performed molecular biology and related experimental methodologies, such as the preparation of competent cells followed by transformation. For expression studies and other methods, I have also performed isolation of DNA/ RNA (manual and Kit), cDNA synthesis, Semi-quantitative PCR, and RT-PCR. Further, I have expertise in multiple nucleic acid and protein detection methods, namely Agarose Gel Electrophoresis, Immunoblotting, Immunofluorescence, ELISA, and Staining techniques (Coomassie).

Apart from the above-mentioned techniques, I have gained much experience with many distinct techniques, such as the generation of bacterial gene knockouts (using the Homologous-recombination method), Flow cytometry, Transmission Electron Microscopy of Bacterial samples (sample preparation), Mass Spectrometry for analysis of metabolites in bacterial lysates (sample preparation), Immunoblotting for studying protein expression in bacteria, Molecular cloning.

Cell Culture and related techniques

I have also gained expertise in cell culture, maintenance and passage with multiple cell lines, namely Murine cell lines [RAW264.7(Macrophage cells)], Human cell lines [Caco-2(Colon carcinoma epithelial cell line), Thp-1 (Peripheral blood leukaemia monocyte cell line), U937 (Lung lymphoma monocyte cell line), HeLa (Cervical cancer cell line), HepG2 (Liver carcinoma cell line). I have further performed several experimental methods using in vitro cell lines:

- Infection studies (gentamicin protection assay)
- Transfection using PEI/ Fugene and shRNA-mediated knockdown studies
- Thp1 trained immunity under hyperglycemic conditions
- Infection into HeLa cell and Live-cell Imaging

Model System for Infection Studies

During my doctoral training, I have gained substantial expertise in handling and infection with mice models such as C57BL/6, BALB/C, and Knockout mice (*gp91phox* KO and *iNOS* KO). Have routinely performed infections through oral gavage, Intraperitoneal route, Intranasal route and dissection to isolate organ tissues (Peyer's patches, Mesenteric Lymph Node, Spleen, Liver, Lungs and Brain), collection of blood from mice (heart puncture and retro-orbital) for multiple. I have further gained experience in the isolation of Primary macrophages from the peritoneal cavity and bone marrow-derived macrophages from mice.

Apart from my major expertise with mice model, I have handled and performed infection studies with plant model systems such as *Arabidopsis thaliana*- growth and maintenance, infection by surface inoculation on Murashige and Skoog agar followed by determination of *Salmonella* infection and colonisation of roots by crushing and CFU analysis.

I have had the experience of handling the Nematode, *C. elegans,* its growth and maintenance on NGM plates, and infection studies with *Salmonella* and *E. coli*.

Biochemical Assays

I have also conducted several biochemical assays such as MTT cell Viability assay, Resazurin assay, bacterial viability assay, H2DFDA and DAF2DA staining assays (for both bacteria and cell lines), Glutathione estimation assay, Griess assay, Colony Forming Unit assay.

Data Analysis and Bioinformatics Tools

Further, I have gained basic skills with GraphPad Prism, Image J software, Zen-Black Microscopy software, SWISS-MODEL, STRING tool, and UniProt.

General

Along with prowess in experimental methodologies, I have gained much skill in Project conceptualisation, design/execution of experiments, data analysis, creating scientific illustrations and manuscript writing, project report writing and presentation and proposal writing. I am also adept in general lab duties and lab maintenance, ordering lab wares and consumables, billing and processing.

- 01/08/2016 – 31/05/2018 Kolkata, India

  MASTER OF SCIENCE (M. SC)- University of Calcutta

Address: Department of Biochemistry, University of Calcutta, 35, Ballygunge Circular Road, West Bengal, India, 700019, Kolkata, India

Website:https://www.caluniv.ac.in/academic/Biochemistry.html

Field of study: Biochemistry

Courses: Biochemistry, Cell Biology, Molecular Biology, Immunology, Microbiology, Genetics, Bioinformatics, Bioenergetics, Biochemistry of selected Infectious and Non-infectious Diseases and other related courses. Choice-based Credit course - Neuroscience and Environmental Science

Final grade: 5.216/6 SGPA (84.3%) (Ranked First)

Dissertation: M.Sc Dissertation (2 months 15 days)

  - Dissertation Project Title: Development of a novel and unbiased methodology for the determination of RNA-binding proteins and micro-RNA interactions

- Dissertation Project Supervisor: Dr. Partho Sarathi Ray, Department of Biological Sciences, Indian Institute of Science Education and Research, Kolkata

- 01/08/2013 – 30/06/2016 Kolkata, India

  BACHELOR OF SCIENCE (B. SC)- University of Calcutta

  Address:10, Shyama Prasad Mukherjee Rd, Jatin Das Park, Bhowanipore, Kolkata, West Bengal, 700025, Kolkata, India

  Website:https://asutoshcollege.in/new-web/about-biochemistry.html

  Field of study: Biochemistry

  Courses: Biochemistry, Cell Biology, Molecular Biology, Immunology, Biophysics, Inorganic and Organic Chemistry, Mathematics and Zoology

  Final grade:84 (Ranked Second in University, Ranked First in College)

- 01/04/2011 – 31/03/2013 Kolkata, India

  INDIAN SCHOOL CERTIFICATE EXAMINATIONS (ISC 2013)- M. P Birla Foundation Higher Secondary School

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  Address: Express Dairy, James Long Sarani, Muradpur, Behala, Kolkata, West Bengal, 700034, Kolkata, India

  Field of study: Science

  Subjects: English, Hindi, Mathematics, Physics, Chemistry and Biology

  Final grade: 88.7

- 01/04/1998 – 31/03/2011 Kolkata, India

  INDIAN CERTIFICATE OF SECONDARY EDUCATION (ICSE 2011)- M. P Birla Foundation Higher Secondary School

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  Address: Express Dairy, James Long Sarani, Muradpur, Behala, Kolkata, West Bengal, 700034, Kolkata, India

  Subjects: English, Hindi, Mathematics, Science (Physics, Chemistry, Biology), History Civics and Geography (HCG), Environmental Education.

  Final grade: 91.7

PUBLICATIONS

2024

Salmonella Typhimurium employs spermidine to exert protection against ROS-mediated cytotoxicity and rewires host polyamine metabolism to ameliorate its survival in macrophages

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Nair, A. V., Singh, A., Rajmani, R. S., & Chakravortty, D. (2024). *Redox biology*, 72, 103151.

2024

Spermidine constitutes a key determinant of motility and attachment of *Salmonella* Typhimurium through a novel regulatory mechanism

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Nair, A. V., Singh, A., Devasurmutt, Y., Rahman, S. A., Tatu, U. S., & Chakravortty, D. (2024). *Microbiological research*, 281, 127605.

2023

Decoding the invasive nature of a tropical pathogen of concern: The invasive non-Typhoidal *Salmonella* strains causing host-restricted extraintestinal infections worldwide.

Nair, A. V.*, Hajra, D.*, & Chakravortty, D. (2023). *Microbiological research*, *277*, 127488. (**equal contribution*)

2023

Absence of proline-peptide transporter YjiY in *Salmonella* Typhimurium leads to secretion of factors which inhibits intra-species biofilm formation.

Nair, A. V.*, Chandra, K.*, Chatterjee, R.*, Muralidhara, P., Singh, A., Kamanna, S., Tatu, U. S., & Chakravortty, D. (2023). Microbiological research, 273, 127411 (**equal contribution*)

2023

Syntaxin 3 SPI-2 dependent crosstalk facilitates the division of *Salmonella* containing vacuole.

Chatterjee, R., **Nair, A. V**., Singh, A., Mehta, N., Setty, S. R. G., & Chakravortty, D. (2023). *Traffic (Copenhagen, Denmark)*, *24*(7), 270–283.

2023

Salmonella Typhimurium PgtE is an essential arsenal to defend against the host resident antimicrobial peptides.

Chatterjee, R., Chowdhury, A. R., **Nair, A. V**.*, Hajra, D.*, Kar, A., Datey, A., Shankar, S., Mishra, R. K., Chandra, N., & Chakravortty, D. (2023). *Microbiological research*, 271, 12735 (**equal contribution*)

2022

Salmonella Typhimurium U32 peptidase, YdcP, promotes bacterial survival by conferring protection against in vitro and in vivo oxidative stress.

Nair, A. V.*, Hajra, D.*, Roy Chowdhury, A.*, Mukherjee, S., Chatterjee, R., & Chakravortty, D. (2022). *Microbial pathogenesis*, *173*(Pt B), 105862. (**equal contribution*)

2021

An elegant nano-injection machinery for sabotaging the host: Role of Type III secretion system in virulence of different human and animal pathogenic bacteria.

Nair, A. V.*, Hajra, D.*, & Chakravortty, D. (2021). *Physics of life reviews*, 38, 25–54. (**equal contribution*)

2019

Rhizospheric life of *Salmonella* requires flagella-driven motility and EPS-mediated attachment to organic matter and enables cross-kingdom invasion.

Karmakar, K., **Nair, A. V**., Chandrasekharan, G., Garai, P., Nath, U., Nataraj, K. N., N B, P., & Chakravortty, D. (2019). *FEMS microbiology ecology*, *95*(8), fiz107.

PATENTS

Facile dispersion of mature biofilm of *Klebsiella pneumoniae* using a cow rumen microbial enzyme

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Patent No. 524536 CS-IPC-2023-038

Dr. Debashish Das, Dr. Dipshikha Chakravortty, Reshma Ramakrishnan**, Abhilash Vijay Nair**, Kirti Parmar

Granted on: 13.03.2024 by The Patent Office, Gov. of India

CONFERENCES AND SEMINARS

- 07/06/2023 – 09/06/2023 Institut Pasteur Paris, France

  CELL SYMPOSIA: INFECTION BIOLOGY IN THE AGE OF THE MICROBIOME

  Presented poster on: Spermidine facilitates the adhesion and subsequent invasion of *Salmonella* Typhimurium into epithelial cells via the regulation of surface adhesive structures and the SPI-1

- 18/01/2023 – 21/01/2023 IISC BANGALORE, INDIA

  BIOLOGICAL TRANSACTION FROM MOLECULES TO ORGANISM (BTMO) 2023

  Volunteered and attended

- 21/12/2019 IISC BANGALORE, INDIA

  ESKAPE PATHOGENS SYMPOSIUM

  Attended

- 03/09/2018 – 07/09/2018 IISC BANGALORE, INDIA

  ANIMAL CARE AND USE

  CAF orientation course and training on animal handling

- 17/03/2017 DEPARTMENT OF BIOCHEMISTRY, UNIVERSITY OF CALCUTTA, INDIA

  CAS-PHASE II SPONSORED ONE-DAY SYMPOSIUM ON “EMERGING TRENDS IN BIOLOGY”

  Volunteered and Attended

HONOURS AND AWARDS

- DR. KV RAO SCIENTIFIC SOCIETY RESEARCH AWARDS-2024

  Awarded with KVRSS Research Award in Jeevanam (Biology)- Runner-up II (Third Position All-India)

- NATIONAL ELIGIBILITY TEST (NET)-2018 – COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, INDIA

  Qualified National Eligibility Test (CSIR) with Lectureship

- GRADUATE APTITUDE TEST IN ENGINEERING (GATE) -2018 – GATE-MHRD

  Qualified GATE 2018 with AIR-101

- PROF. J.J. GHOSH FOUNDATION AWARD 2018 – PROF. JJ GHOSH FOUNDATION

  Awarded on the First merit in Neuro-biochemistry, University of Calcutta

- ENDOWMENT BOOK PRIZE-1(2017) – UNIVERSITY OF CALCUTTA

  Awarded on the First merit in second-semester examinations, Dept. of Biochemistry, University of Calcutta

- BAIDYA NARAYAN ENDOWMENT SCHOLARSHIP AWARD- 2017 – UNIVERSITY OF CALCUTTA

  Awarded on First merit in third-semester examinations, Dept. of Biochemistry, University of Calcutta

- SHUBHARANI GHOSH MEMORIAL PRIZE-2017 – ASUTOSH COLLEGE

  Awarded on First merit in Bachelor of Science in Biochemistry (Honours)

ARTICLES IN PUBLIC DOMAINS

- THE TIMES OF INDIA: NEW STRATEGY FOUND TO COMBAT DRUG-RESISTANT *SALMONELLA*

  Coverage of the Peer-reviewed publication and News Release on 07 May 2024

  https://timesofindia.indiatimes.com/india/new-strategy-found-to-combat-drug-resistant-salmonella/articleshow/109911640.cms

- IISC BANGALORE NEWS: TARGETING SPERMIDINE PRODUCTION TO COMBAT EMERGING DRUG RESISTANCE IN SALMONELLA

  News Release by IISc Bangalore on 07 May 2024

  https://iisc.ac.in/events/targeting-spermidine-production-to-combat-emerging-drug-resistance-in-salmonella/

- BIOSPECTRUM INDIA: SCIENTISTS TARGET SPERMIDINE PRODUCTION TO COMBAT EMERGING DRUG RESISTANCE IN SALMONELLA

  News Release by BioSpectrum India on 07 May 2024

  https://www.biospectrumindia.com/news/58/24596/scientists-target-spermidine-production-to-combat-emerging-drug-resistance-in-salmonella.html

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- EUREKAALERT AAAS: TARGETING SPERMIDINE PRODUCTION TO COMBAT EMERGING DRUG RESISTANCE IN *SALMONELLA*.

  News Release on 08 May 2024

  https://www.eurekalert.org/news-releases/1043938

- PHARMABIZ.COM: RESEARCHERS AT IISC IDENTIFY A MOLECULE WHICH CAN REDUCE SPERMIDINE PRODUCTION

  News Release by PharmaBiz.com India on 13 May 2024

  https://www.pharmabiz.com/NewsDetails.aspx?aid=169089&sid=1

- THE INDIAN EXPRESS: DFMO DRUG USED TO TREAT AFRICAN TRYPANOSOMIASIS CAN HELP TREAT TYPHOID

  Coverage of the Peer-reviewed publication and News Release on 15 May 2024

  https://www.newindianexpress.com/xplore/2024/May/15/dfmo-drug-used-to-treat-african-trypanosomiasis-can-help-treat-typhoid

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- HINDUSTAN TIMES: TYPHOID: NEW DRUG TO TREAT TYPHOID CAUSED BY SALMONELLA - WHAT DOES THE DOCTOR SAY?

  Coverage of the Peer-reviewed publication and News Release on 16 May 2024

  https://tamil.hindustantimes.com/lifestyle/a-new-drug-for-the-treatment-of-typhoid-caused-by-salmonella-bacteria-131715763013627.html

MANAGEMENT AND LEADERSHIP SKILLS

- MENTORSHIP FOR IGEM-2023

  Co-mentored the IISc iGEM Team for the year 2023

- MENTORING OF SUMMER/DISSERTATION TRAINEE:

  I got the opportunity to mentor 17 summer and dissertation trainees at the Microbial Pathogenesis Lab, IISc.

  2 (Indian Academy of Science interns), 2 (Int. PhD IISc), 1 (UG IISc), 10 (MSc. Dissertation interns), 1 (Summer Research intern), 1 (School student)

- TEACHING ASSISTANCE

  Teaching Assistance for Microbiology (Practical Course), UG IISc -2021

LANGUAGE SKILLS

Mother tongue(s): MALAYALAM

Other language(s): ENGLISH, HINDI and BENGALI

HOBBIES AND INTERESTS

Designing and Art

Creative skill: Scientific illustrations to art and painting

REFEREES

- PROF. DIPSHIKHA CHAKRAVORTTY

Professor,

Department of Microbiology and Cell Biology, Indian Institute of Science, Bangalore, India.

dipa@iisc.ac.in

- PROF. KITHIGANAHALLI NARAYANASWAMY BALAJI

Professor,

Department of Microbiology and Cell Biology, Indian Institute of Science, Bangalore, India.

balaji@iisc.ac.in

- PROF. AJIT KUMAR P

ICMR Emeritus Professor,

Department of Microbiology and Cell Biology, Indian Institute of Science, Bangalore, India.

ajit@iisc.ac.in