PUSPANGANA SINGH

Areas of interest: Microscopy & Biophysics

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EDUCATION

PhD

Indian Institute of Technology Kanpur (IIT Kanpur)

Joined July 2019

In the Lab of Single Molecule Biophysics & Virology, Department of Biological Sciences & Bioengineering.
Currently writing thesis; to be submitted by November 2023.

M.Sc. Applied Microbiology

Banaras Hindu University (BHU)

2017 - 2019

9.15 CGPA
(1st Division, 2nd rank in class)

B.Sc. (Honours) Microbiology

Gargi College, University of Delhi

2014 - 2017

77.05%
(1st Division, 3rd rank in class)

Senior Secondary School Certificate

Udai Pratap Public School, Varanasi, Uttar Pradesh

2012 - 2014

94.6% (Physics, Chemistry, Biology, Computer Science, English)
(1st Division; 1st rank in class)

Higher Secondary School Certificate

Udai Pratap Public School, Varanasi, Uttar Pradesh

2012

10.0 CGPA [Out of 10]
(1st Division; 1st rank in class)

PROFILE

I have pursued my doctoral thesis as a Prime Minister Research Fellow, which is a prestigious fellowship in the country bestowed by the Ministry in India on the basis of project proposal, to a handful of candidates in the country. I have hands-on experience in single molecule imaging (smFRET), including slide and sample preparation. I have worked on developing pseudovirions using the orthogonal translation method for imaging and other biophysical assays.

shorturl.at/bitUW

RESEARCH EXPERIENCE

PhD

July 2019

Indian Institute of Technology Kanpur (IIT Kanpur), Kanpur
Under the supervision of Dr. Dibyendu Kumar Das.
I have worked on unravelling the conformational dynamics of viral glycoproteins using state-of-the-art single molecule visualization techniques using fluorescence. I have developed smFRET assay to understand the dynamics of the open and close RBD (Receptor Binding Domain) movement of the CoV spike glycoprotein at the single molecule level. I have also worked with single molecule imaging to understand the mechanism of interaction between phosphatidylserine (PS) and the SARS-CoV-2 spike protein. I have designed fluorescence-based dequenching assays to understand the triggering factors involved in SARS-CoV-2 fusion. Using these assays, I have shown that the SARS-CoV-2 spike is a dynamic calcium sensor in the presence of lysosomal (low) pH.

M.Sc. Dissertation Project

Centre for Cellular and Molecular Biology (CCMB), Hyderabad — Jan - June 2019

Under the supervision of Dr. Rajan Sankaranarayanan.
In this project, I contributed to unravel the puzzle of why highereukaryotes (animalia) require an addition deacylase along with D-amino tRNA deacylase (DTD) in order to maintain translational fidelity, both in vivo and in vitro. My work revolved around threonyl-tRNA synthetase (ThrRS) whose editing activity gets modified under oxidative stress, which leads to mischarging on tRNAThr, and how another trans factor enters this picture. The work involved cloning, expression and purification of Mus musculus ThrRS to get a functional enzyme for aminoacylation (charging) and editing. Along with this, I also performed in vivo work on *Saccharomyces cerevisiae* to check the role of ATD in preventing serious mistranslations like that of alanine over tRNA-Pro.

IAS-INSA-NASI Summer Research Fellow

Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad — May - July 2018

Under the supervision of Dr. Rupinder Kaur.
Undertook a project entitled 'Characterisation of Chaperonin Proteins in *Candida glabrata*'.
The goal of my project was to delineate the role of *Candida glabrata* chaperonin proteins in azole tolerance and PI(3,5)P2-mediated (phosphatidylinositol (3,5) bisphosphate) signaling in order to study drug tolerance and resistance. I achieved my goal through cloning the full-length genes of the three chaperonins in SFB-tagged (S-protein tag, FLAG tag, Streptavidin-binding protein) plasmids, transforming in *C. glabrata* cells and checking for the expression of these proteins by Western blotting. In parallel with this, I also undertook the strategy of homologous recombination to make the deletion strains for the respective chaperonin genes.

TEACHING EXPERTISE

- NPTEL, Cell Culture Technologies, IIT Madras (2022): Live problem solving sessions
  Link to videos: https://t.ly/ZO6b
- Microbiology and Immunology course to B.Tech (2nd year) students of AITH, Kanpur (2022-2023)
- Kendriya Vidyalaya (KV), IIT Kanpur Campus: Biology to class 11th students (2021-2022)
- Online lectures on YouTube on Virology for Undergraduates (2022)

MENTORING EXPERIENCE

Mentored the following students who are now pursuing science in different capacities:

1. Sayoni Saha (Trained as Summer Trainee): Working at ZS, Pune
2. Monalisa Chakraborty (Trained as M.Tech student): Pursuing PhD from Texas A&M University
3. Tarun Mascarenhas (Trained as B.Tech student): Pursuing M.Sc. from the University of Gottingen
4. Shreya Mukherji (Trained as M.Tech student): Pursuing M.Tech from IIT Kanpur
5. Asutosh Behera (Trained as PhD student): Pursuing PhD from IIT Kanpur

EXTRACURRICULAR ACTIVITIES

- Involved in departmental newsletter team (IIT Kanpur)
- Editor-in-Chief for Eureka! The Science Magazine (Gargi College)
- Cover page design team member for departmental brochure (IIT Kanpur)
- Creative writer and spoken word artist for the creative writing society, Quilluminati (Gargi College)

PUBLICATIONS

- **Singh P**., Mukherji S., Basak S., Hoffmann M., Das DK. (2022). Dynamic Ca2+ Sensitivity Stimulates the SARS-CoV-2 Evolved Spike Strain-Mediated Membrane Fusion For Enhanced Viral Entry. Cell Reports. 39, 110694. https://doi.org/10.1016/j.celrep.2022.110694.
- **Singh P**., Karmakar S., Pahari P., Mukherjee S., Hoffmann M., Mandal T., Das DK (2022). SARS CoV-2 spike fusion peptide trans-interaction with Phosphatidylserine (PS) lipid triggers membrane fusion for entry. [Manuscript in press]
- **Singh P**. (2022). Venturing into the real-time conformational landscape of the spike protein of coronaviruses for host cell entry. NCEIB-2022-Book of Abstracts, Environmental Science and Pollution Research, page 93.

CONFERENCES

- Invited for student talk on enhanced calcium sensitivity in evolved SARS-CoV-2 strains for fusion and entry in the **Gordon Research Seminar (GRS) Physical Virology** (January 22, 2023) in Italy.
- Poster titled 'Enhanced calcium sensitivity in evolved SARS-CoV-2 strains for fusion and entry' accepted for presentation in the **Gordon Research Conference (GRC) Physical Virology** (January 21-27 2023) in Italy.
- Puspangana Singh, Dibyendu Kumar Das. Venturing into the Real-Time Conformational Landscape of the Spike Protein of Coronaviruses. **LMB-UNIGE Graduate Life Sciences Symposium. LMB- MRC, Cambridge University** (Virtual). July 8-10, 2020. [Student talk].
- Puspangana Singh, Dibyendu Kumar Das. Mapping the Conformational Dynamics of MERS-CoV Spike Protein. **LMB-UNIGE Graduate Life Sciences Symposium. LMB-MRC, Cambridge University** (Virtual). July 8-10, 2020. [Poster].
- Puspangana Singh, Santosh Kumar Kuncha, Rajan Sankaranarayanan. Cloning, Expression and Purification of Mus musculus Threonyl-tRNA Synthetase (MmThrRS). **Centre for Cellular and Molecular Biology (CCMB, Hyderabad)**. May 31st, 2019. [Poster].
- Puspangana Singh, Priyanka Bhakt, Rupinder Kaur. Characterisation of Chaperonin Proteins in Candida glabrata. Summer Trainee Colloquium. **Centre for DNA Fingerprinting and Diagnostics (CDFD, Hyderabad)**. June 29th, 2018. [Student talk].

AWARDS & ACHIEVEMENTS

- Awarded the **Carl Storm International Diversity Award** in Physical Virology GRC (January 22-27 2023) in Italy.
- Awarded the **Prime Minister Research Fellowship (PMRF)**, Lateral Entry, May 2020 Cycle
- Awarded the **IAS-INSA-NASI Summer Research Fellowship** (May 2018-July 2018): Fellowship for pursuing a summer research project in the lab of Dr. Rupinder Kaur, CDFD, Hyderabad
- Awarded the **CBSE CSSS Scholarship** (2014-2019)
- **1st Prize:** Puspangana Singh, Dibyendu Kumar Das. Mapping the Conformational Dynamics of MERS-CoV Spike Protein. LMB-UNIGE Graduate Life Sciences Symposium. LMB-MRC, Cambridge University (Virtual). July 8-10, 2020. [Poster].
- **1st Prize [Shakuntala Tiwari Memorial Research Excellence Award]:** Puspangana Singh. Venturing into the real-time conformational landscape of the spike protein of coronaviruses for host cell entry. National Conference on Environmental and Industrial Biotechnology (NCEIB). Dr. Ambedkar Institute of Technology for Handicapped, Kanpur. November 10-12, 2022. [Student talk].
- **3rd Prize:** Puspangana Singh, Priyanka Bhakt, Rupinder Kaur. Characterisation of Chaperonin Proteins in Candida glabrata. Summer Trainee Colloquium. Centre for DNA Fingerprinting and Diagnostics (CDFD, Hyderabad). June 29th, 2018. [Student talk].