

Arnab Basu, Ph.D.

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DOB: 29/09/1981

RESEARCH INTEREST

Virulence/antibiotic resistance of human pathogen methicillin-resistant *Staphylococcus aureus* (MRSA) and other gram positive and negative bacteria.

- (1) Role of different ribosome bound GTPases on stringent response of *S aureus*.
- (2) Role of alarmone (ppGpp) on stress response of different bacteria.
- (3) Exploring the effect of different inhibitory molecules on virulence and antibiotic resistance.
- (4) Bacterial chaperone and toxin production..
- (5) Eukaryotic translation.

DEGREES AND RESEARCH EXPERIENCES

2014-August 2019	Post-doctoral fellow, Department of Biochemistry and Molecular Biology Saint Louis University, Saint Louis, MO-63104, USA Mentor: Dr. M.-N. Frances Yap
Dec 2013 – Sept 2014	Post-doctoral fellow, Chemical Sciences Division, Saha Institute of Nuclear Physics, India. Mentor: Prof. Munna Sarkar
2006-Nov 2013	Ph.D. (Biochemistry), University of Calcutta and Department of Microbiology, Bose Institute, India. Advisor : Prof. Sujoy K. Das Gupta
2003-2006	M.Sc. (Biochemistry), University of Calcutta, India Advisor : Prof. Dhruvajyoti Chattopadhyay
2000-2003	B.Sc. (Microbiology), University of Calcutta, India

Professional Experience

Sept 2020-
Till date Associate Professor and Ramalingaswami Fellow at Amity University Kolkata

PUBLICATIONS

Postdoctoral training (October 2014- Present)

Arnab Basu, Kate Shields, M.-N.Frances Yap; 2020, Hibernating 100S complex is a target of ribosome recycling factor and elongation factor G in *Staphylococcus aureus*, **Journal of Biological Chemistry** (Accepted).

Arnab Basu, Kate Shields, Christopher S. Eickhoff, Daniel F. Hoft, M.-N.Frances Yap; 2018, Thermal and nutritional regulation of ribosome hibernation in *Staphylococcus aureus*, **J Bacteriol.** 200(24) DOI: 10.1128/JB.00426-18

Arnab Basu, M.-N. Frances Yap; 2017, Disassembly of the *Staphylococcus aureus* hibernating 100S ribosome by an evolutionary conserved GTPase, **Proceedings of the National Academy of Sciences**, USA 114(39): 8165-8173

Donna Matzov, Shintaro Aibara, **Arnab Basu**, Ella Zimmerman, Anat Bashan, M.-N Frances Yap, Alexē Amunts , Ada Yonāth ; 2017, The Cryo-EM structure of hibernating 100S ribosome dimer from pathogenic *Staphylococcus aureus*, **Nature Communications**, 8(1):723

Arnab Basu, M.-N. Frances Yap; 2016, Ribosome hibernation factor promotes Staphylococcal survival and differentially represses translation, **Nucleic Acid Research**, 44(10):4881-4893

Postdoctoral training (2013-Sept 2014)

Arnab Basu*, Tahsina Shireen*, Munna Sarkar, Kasturi Mukhopadhyay; 2015, Lipid composition is an important determinant of antimicrobial activity alpha-melanocyte stimulating hormone, **Biophys Chem.** 196:33-39 ★Equal authorship.

Ph.D (2006-2013)

Arnab Basu, Sujoy Chatterjee, Soniya Chatterjee, Sujoy K. Das Gupta; 2012, An Evolutionary link between the mycobacterial plasmid pAL5000 replication protein RepB and Extra Cytoplasmic Function (ECF) family of σ factors. **J Bacteriol**, 194(6), 1331–1341. (Mentioned in **NATURE INDIA**, 2012 April)

Sujoy Chatterjee, **Arnab Basu**, Abhijit Basu, Sujoy K. Das Gupta; 2007, DNA Bending in the Mycobacterial Plasmid pAL5000 Origin-RepB Complex. **J Bacteriol.** 189:8584–8592

Sonia Chatterjee, Madhumanti Patra, Sourabh Samadder, **Arnab Basu**, Sujoy K Das Gupta; 2017, Mutual interaction enables the mycobacterial plasmid pAL5000 origin binding protein RepB to recruit RepA, the plasmid replicase, to the origin. **Microbiology**, 163(4):595-610

Awards and Scholarship

2020 Ramalingaswami Fellowship (2020-2025)

2017 Departmental research spotlight award Saint Louis University.

2017 National Institute of Health (NIH) Postdoctoral Fellowship.

2012 Article nominated in Nature India's Biochemistry section.

2006 Graduate Aptitude Test in Engineering (GATE, February 2006) conducted by Indian Institute of Technology (IIT), Kanpur, India passed in Life Sciences.

2003 National Scholarship, University of Calcutta, for outstanding result in B.Sc.

SUMMARY OF RESEARCH ACTIVITY CONDUCTED

Postdoctoral research (2014- 2019)

Assembly and disassembly of the hibernating bacterial 100S ribosome

During my stay in Dr. Frances Yap's lab, I have been working with the stress response mechanism of pathogen *S aureus*. Translation is an important biological process critical for all life. Suppression of ribosome biogenesis and translation have been linked to bacterial persistence and slow growth inside the animal hosts. In Gram-positive human pathogen *Staphylococcus aureus*, a ribosome-binding protein called hibernation-promoting factor (HPF) dimerizes the 70S ribosome to form the translationally inactive 100S complex. The formation of 100S ribosome in *S. aureus* is distinct than that of the majority of the gammaproteobacteria (**Matzov et al. Nat Commns, 2017**). With the help of biochemical techniques we established that the formation of 100S ribosome is essential for better survival and maintaining translation for longer time under adverse condition (**Basu et al, NAR, 2016**). In the other part of the story, we identified a bona fide dissociation factor responsible for the disassembly of 100S ribosome. Our recent study showed that HflX is that potent dissociation factor in *S aureus*, which highly expresses under heat stress condition and helps in dissociation of 100S ribosome to continue residual translation (**Basu et al, PNAS 2017**).

Postdoctoral Research (2013-2014)

Lipid-antimicrobial peptide interaction and detection of membrane perturbation and change in vesicular structure.

I started my postdoctoral training in SINP under the guidance of Prof. Munna Sarkar. I was involved in a project which deals with the antimicrobial effect of a certain peptide, namely Alpha-melanocyte stimulating hormone(α -MSH) in *S aureus*. Our goal was to explore the anti-microbial effect of that peptide which can pave the way of eradication of *S aureus* infection. In our effort to do so we use liposome as our working tool which can mimic bacterial membrane structurally. With the help of certain biophysical techniques (such as fluorescence spectroscopy, CD spectrum analysis) we could show that the peptide can efficiently interacts with the membrane components of *S aureus* and disrupts the membrane structure at least under *in-vitro* condition. Though we haven't done any *In-vivo* analysis, still the finding was good enough to follow up with *in-vivo* model system.

Ph.D. program

An Evolutionary link between the mycobacterial plasmid pAL5000 replication protein RepB and Extra Cytoplasmic Function (ECF) family of σ factors.

I did my Ph.D under supervision of Prof. Sujoy K. Das Gupta where I investigated the role of replication protein RepB in *Mycobacterium smegmatis*'s life cycle. It was known since long ago that RepB binds to origin of replication of *M smegmatis* and facilitates the replication process. But till then we didn't know much about the interaction between replication origin and RepB in terms of structural point of view. We took help of DNA binding assays (such as EMSA, DNA footprinting) and proved that RepB binds to the origin of replication with bending the region asymmetrically. There are few residues in the origin of replication, which control the process and abolition of those can change the trajectory of bending from asymmetric to symmetric. The other aspect where we wanted to focus on is the evolutionary significance of RepB. Our bioinformatics analysis showed that the protein was a direct ancestor of extra Cytoplasmic Function (ECF) σ factors and finally diverged into a replication protein of different function. We did the analysis by comparing the structure-function relation of those proteins, which efficiently shows the transformation.

Teaching experience

1. Took a course of Ph.D course work on "Research techniques in molecular biology" in Department of Biotechnology, Amity University Kolkata (Oct, 2020-Feb, 2021)
2. Took the "Protein Engineering" course of M.Sc Biotechnology (Jan, 2021-April 2021).
3. Took the "Chemical Biology" course of B.Sc Biotechnology (March 2021-May, 2021).

REFERENCES

Dr. M.-N. Frances Yap

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