BIOGRAPHICAL SKETCH

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NAME: Anita Nag

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POSITION TITLE: Assistant Professor of Chemistry

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Jadavpur University, Calcutta, India	B. Sc	08/1998	Chemistry (Honors)
Indian Institute of Technology, Kanpur (IIT), India	M. Sc	05/2000	Chemistry
University of California, Los Angeles, CA	Ph. D	06/2007	Chemistry
Yale University, New Haven, CT	Postdoc	12/2009	Biochemistry
Florida State University, Tallahassee, FL	Postdoc	08/2012	Molecular virology

A. Personal Statement

My research expertise and interest in virus-initiated host shutoff lies at the nexus of gene expression, mRNA stability and nuclear-cytoplasmic transport. My doctoral training in Dr. Harold Martinson's laboratory at UCLA (2001-2007), particularly on mRNA processing, enabled me to dissect the interaction between RNA polymerase II and RNA processing proteins. I further expanded my experience during my postdoctoral training in Dr. Joan Steitz's laboratory at Yale University (2007-2009) by studying the relationship between RNA decay and RNA processing that triggers erroneous mRNAs to be degraded in the nucleus. Through these experiences, I developed a strong interest in understanding how viruses exploit cellular machineries. Hence, supported by the Leukemia Lymphoma postdoctoral scholarship, I conducted research on hepatitis C virus in Dr. Hengli Tang's laboratory (2010-2012) at FSU.

Throughout my academic training, I developed a keen interest in mentoring undergraduate students in research. Hence, I serve at primarily undergraduate universities to pursue my interests. As a faculty member at Florida A&M University (an HBCU, 2012-2016) and at Furman University (a PUI, 2016-2019), I enjoyed training undergraduate students both in the classroom and in my research laboratory. In 2017, we began our work to study nonstructural protein 1 (nsp1) of SARS coronavirus (SARS-CoV-1) and identified cellular pathways disrupted by this protein. The area of my research, which lies at the intersection of chemistry, biochemistry and virology, attracted students who want to pursue a career in academia and biomedical sciences.

In my current position as an Assistant Professor of Chemistry at the University of South Carolina Upstate (2019-present), I continue to expand my research portfolio to both SARS-CoV-1 and SARS-CoV-2 and mentor students in my research group. During the CoVID-19 pandemic, when most of the teaching continued to be virtual, my laboratory conducted research with undergraduate researchers supported by multiple university-level (ASPIRE-I, RISE, Magellan) and outside funding (DRP grant, $150k/ 2020-23 from SC INBRE and R15 grant, $406,500 from NIAID). Here, I mentored 14 undergraduate researchers and 1 high school student. Under my mentorship students learn to critically analyze research articles, design their experiments, analyze and present their work in collaborative group meetings and at regional and national conferences. The majority of my students joined graduate school (University of Michigan, Vanderbilt University) or professional school (Medical school: Wayne State and Medical University of South Carolina, MD-PhD: FIU-Scripps Research Institute) or taken up jobs directly related to their research experience (Chemical industry, Chicago University, Greenville Memorial hospital). The majority of these undergraduate students (underlined) co-authored in major peer-reviewed publications as listed below.

1. Characterization of nsp1 binding to the viral RNA leader sequence of severe acute respiratory syndrome coronavirus. Jonathan L. Cromer, Laurie F. Melton, Kaitlin M. Caughman, and Anita Nag. *Biochemistry* **2024**. doi.org/10.1021/acs.biochem.4c00078.

2. Yevgeniy A. Gerassimovich, Samantha J. Milandinovski-Bangall, Kaitlin M. Bridges, Linkel Boateng, Lauren E. Ball, Homayoun Valafar and **Anita Nag**. Proximity-dependent biotinylation detects association between SARS coronavirus nonstructural protein 1 and stress granule-associated proteins. *J of Biol Chem,* 2021; 297: 101399.

3. Garret N. Gomez, Fareeha Abrar, Fabiola G. Gonzalez, Maya P. Dodhia and **Anita Nag**. SARS coronavirus protein nsp1 disrupts localization of Nup93 in the nuclear pore complex and alters cellular localization of nucleolin. *Biochemistry and Cell Biology,* 2019: 97(6): 758-766.

4. Mateeva, N., Eyunni, S.V. K., Redda, K. K., Ononuju, U., Hansberry, T. D. 2nd, Aikens, C., **Nag, A.** Functional Evaluation of Synthetic Flavonoids and Chalcones for Antiviral and Anticancer properties. *Bioorg Med Chem Lett*, 2017**.** 27: 2350.

B. Positions, Scientific Appointments, and Honors

Positions and Employment

2019-Present	Assistant Professor of Chemistry, USC Upstate
2016-2019	Visiting Assistant Professor of Biology and Chemistry, Furman University
2013-2016	Assistant Professor, Department of Chemistry, Florida A & M University
2012-2013	Visiting Assistant Professor, Department of Biology, Florida A & M University
2010-2012	Postdoctoral Research Associate, Florida State University
2007-2010	Postdoctoral Fellow, Yale University

Honors

2022	Propel Research fellow
2021	ASBMB Undergraduate Faculty Meeting Award
2020	Excellence in Teaching & Advising Award, College of Science & Technology, USC Upstate
2014	Faculty Research Award Program, Florida A&M University
2014	American Society of Virology Teacher Travel Award
2008-2011	Postdoctoral Fellowship, Leukemia Lymphoma Society
2007-2008	Anna Fuller Postdoctoral Fellowship
2003	Travel Award, Cold Spring Harbor Laboratory

C. Contributions to Science (Ph. D and Postdoctoral Work)

Uncoupling the steps of RNA transcription and maturation by eukaryotic RNA polymerase II: A significant number of studies have established the mechanism of mRNA transcription initiation and its regulation. However, very little has been known about the complex and coupled steps of transcription termination in eukaryotes that takes place over a kilobase region downstream of the termination site. In my graduate research, I investigated steps by which eukaryotic poly (A) signals direct mRNA 3'-end processing through pausing followed by termination of transcription. By dissecting the poly(A) signal into its components, I showed that pausing and termination requires the processing factor CPSF, which binds the AAUAAA hexamer of the mammalian poly(A) signal but pausing does not require the RNA polymerase II C-terminal domain (CTD) or the cleavage stimulation factor, CstF, that binds the CTD. I continued my work on RNA stability and processing as a postdoctoral fellow at Yale University and showed a novel interaction between RNA decay factor Mtr4 and splicing factor Prp31. This work has established a coupling between various stages of RNA transcription and pre-mRNA processing to mRNA degradation.

1. **Nag, A.,** Narsinh, K., Kazerouninia, A. and Martinson, H. G. “The Conserved AAUAAA Hexamer of the Poly(A) Signal Can Act Alone to Trigger a Stable Decrease in RNA Polymerase II Transcription Velocity”, RNA. 2006, 12, 1534–44, PMCID: PMC1524889.

2. **Nag,** A., Narsinh, K., and Martinson, H. G. “The Poly(A)-Dependent Transcriptional Pause Is Mediated by Cleavage-Polyadenylation Factor CPSF, and Targeted to the Body of the Polymerase”, Nature Structure Molecular Biology. 2007, 14, 662-9, PMID: 17572685.

3. Rigo, F., Kazerouninia, A., **Nag, A.** and Martinson, H. G. “The RNA Tether from the Poly(A) signal to the Polymerase Mediates Coupling of Transcription to Cleavage and Processing”, Molecular Cell. 2005**,** 20, 733–45, PMID: 16337597.

4. **Nag, A.** and Steitz, J. A. “Tri-snRNP-associated proteins interact with subunits of the TRAMP and nuclear exosome complexes, linking RNA decay and pre-mRNA splicing”, RNA Biol*.* 2012, 9, PMCID: PMC3384585

Contributions to Science (Independent Work)

Understanding the mechanism of HCV inhibitory drugs: About 3% of the world population is infected by the hepatitis C virus. Without any available vaccine, several promising drugs were in the clinical trial phase during the last decade. Among them, cyclosporine A and its derivatives showed a promising effect on HCV patients. But many patients relapsed quickly as genomic mutations blocked the drug’s function. In order to understand the mechanism of inhibition by these drugs, I showed that cyclosporine A suppresses interaction between viral nonstructural protein 5A (NS5A) with viral RNA which effectively blocks the assembly of infectious HCV particles. Moreover, during my independent work at Florida A&M University, I collaborated with Dr. Nelly Mateeva and screened a library of flavonoids and chalcones and identified the mechanism by which active chalcones block HCV translation.

5. Yang, F., Robotham, J. M., Grise, H., Frausto, S., Madan, V., Zayas, M., Bartenschlager, R., Robinson, M., Greenstein, A. E., **Nag, A.,** Logan, T. M., Bienkiewicz, E. and Tang, H. “A Major Determinant of Cyclophilin Dependence and Cyclosporine Susceptibility of Hepatitis C Virus Identified by a Genetic Approach”, Plos Pathogen*.* **2010**, 6: e1001118, PMCID: PMC2944805.

6. **Nag, A.,** Robotham, J. M. and Tang, H. "Cyclophilin inhibitors suppress NS5A RNA binding and the assembly of infectious hepatitis C virus particles" J of Virology **2012**, 86, 12616-24, PMCID: PMC3497644.

7. Mateeva, N., Eyunni, S. V. K., Redda, K. K., Ononuju, U., Hansberry II, T. D., Aikens, C. and **Nag, A.** “Functional evaluation of synthetic flavonoids and chalcones for potential antiviral and anticancer properties” Bioorganic & Medicinal Chemistry Letters **2017**, 11: 2350-56.

Dissecting the mechanism of host shutoff by severe acute respiratory syndrome coronavirus (SARS-CoV): SARS-CoV outbreak in China during 2002-2003 and subsequent spread to about 12 other countries, resulted in 8% fatality to infected individuals. Among sixteen nonstructural proteins synthesized from the 30 kilobases long positive strand viral genome, nonstructural protein 1 (nsp1) serves as a host shutoff protein which dampens host gene expression by inhibiting translation and subsequently cleavage of cellular mRNAs. My laboratory identified a novel mechanism of inhibition of host gene expression by nsp1. In collaboration with Dr. Lauren Ball (MUSC), we conducted proteomics experiments and identified nucleoporins (Nup93 and Nup210) to interact with nsp1. We further showed that the expression of nsp1 leads to the accumulation of Nup93 in the nucleoplasm and results in a significant change in localization of RNA binding protein nucleolin. More recently, we used proximity dependent biotinylation to show interaction between nsp1 and several RNA binding proteins, including proteins that assemble in the stress granules. With this work, we demonstrated a clear role of nsp1 beyond suppression of translation.

8. Yevgeniy A. Gerassimovich, Samantha J. Milandinovski-Bangall, Kaitlin M. Bridges, Linkel Boateng, Lauren E. Ball, Homayoun Valafar and **Anita Nag**. Proximity-dependent biotinylation detects association between SARS coronavirus nonstructural protein 1 and stress granule associated proteins. *J of Biol Chem,* 2021; 297: 101399.

9. Garret N. Gomez, Fareeha Abrar, Fabiola G. Gonzalez, Maya P. Dodhia and **Anita Nag**. SARS coronavirus protein nsp1 disrupts localization of Nup93 in the nuclear pore complex and alters cellular localization of nucleolin. *Biochemistry and Cell Biology,* 2019: 97(6): 758-766.

10. Niharika Pandala, Casey A. Cole, Devaun McFarland, **Anita Nag**, Homayoun Valafar. A Preliminary Investigation in the Molecular Basis of Host Shutoff Mechanism in SARS-CoV. In BCB '20: 11th ACM International Conference on Bioinformatics, Computational Biology and Health Informatics, Virtual Event, USA, September 21-24, 2020. ACM, 2020.

11. Linkel Boateng, **Anita Nag**, Homayoun Valafar. Computational modeling of SARS-CoV-2 Nsp1 binding to human ribosomal 40S complex. BCB '21: 12th ACM International Conference on Bioinformatics, Computational Biology and Health Informatics, Gainesville, Florida, USA, August 1-4, 2021. ACM, 2021.

Contributions to Undergraduate Education

I am dedicated to teaching and mentoring undergraduate students in the classroom and laboratory research. My contributions towards mentoring undergraduate researchers in my laboratory resulted in multiple publications listed above. In addition to mentoring students in laboratory research, I have introduced multiple high impact experiential learning methods in my classroom to bring in critical thinking, problem solving, and course based undergraduate research experience (CURE). Some of these activities were published in a peer-reviewed education journal. I am also serving in the Belonging and Equity Transformation Team (USC Upstate, 2021-22) and in the Maximizing Access Committee (ASBMB, 2022-2025) to increase diversity and inclusion in science education.

12. Insights Gained from a Hybrid Inquiry-Driven Biochemistry Laboratory during the COVID-19 Pandemic. Anita Nag, *J. Chem. Edu.* **2023**. DOI: 10.1021/acs.jchemed.3c00111.

13. **Nag, A.** End of the Semester Review of Biochemistry Using a Case Study on Phosphoglucose Isomerase Deficiency. *J Chem Edu*, 2020; 97(9): 2664-2668.

Complete list of my publication in MyBibliography

https://www.ncbi.nlm.nih.gov/myncbi/anita.nag.1/bibliography/public/