Sourav Kumar Dey, PhD

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Current position

Assistant Professor, IIT (ISM) Dhanbad, Dhanbad, India (from August 2022).

Education

| 2016-2021 | Weill Cornell Medical College, New York, USA Postdoctoral Associate, Department of Pharmacology Advisor: Dr. Samie R. Jaffrey |
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| 2010–2016 | Carnegie Mellon University, Pittsburgh, USA Graduate Student, Department of Chemistry Doctor of Philosophy (PhD) Co-advisors: Dr. Subha R. Das and Dr. Linda A. Peteanu |
| 2007-2009 | Indian Institute of Technology, Kanpur, India. Master of Science (M. Sc.) in Chemistry |
| 2004-2007 | Presidency College, Kolkata, India. Bachelor of Science (B. Sc.) in Chemistry |

Research experience

Postdoctoral Research: Weill Cornell Medical College, Sept 2016-Sept 2021

| Research focus | Development of novel fluorogenic aptamers for live cell RNA imaging tags and RNA-based metabolite sensors. |
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| Relevant skills | Development of novel SELEX methods for generating high affinity and extremely bright RNA-fluorophore complexes from bacterial riboswitches. |
| | Synthesis of new classes of fluorogenic dyes. |
| | Development of RNA-based metabolite sensors for quantitative real time imaging in live cell. |
| | Live cell imaging of single mRNAs using fluorogenic RNA aptamers. |
| | Development of novel RNA-based affinity tags for protein pulldown for studying RNA-protein interaction. |

Graduate Research: Carnegie Mellon University, Dec 2010- Sept 2016.

Dissertation title Biochemical and Single Molecule Studies of Backbone Branched RNA and Lariat Debranching Enzyme (Dbr1p).

- Relevant skills Solid phase synthesis of DNA and RNA, including modifications for probes, backbone branches and mini-lariats. Nucleic acid characterization using HPLC, ion-exchange chromatography, acrylamide and agarose gel electrophoresis; UV-Visible spectroscopy, MALDI-TOF, ESI etc.
 - Click chemistry for bio-conjugation of proteins, nucleic acids and small molecules.
 - Enzyme kinetics using real time fluorescence, anisotropy and stopped-flow methods.
 - Steady state and time resolved fluorescence spectroscopy techniques including FRET and anisotropy.
 - Setup and use of TIRF and confocal microscopes for single molecule fluorescence studies using FRET. Analysis of single molecule images using software such as ImageJ and Image-Pro Plus.

Publications and presentations

Published Manuscripts

* indicates authors who contributed equally.

1. VarnBuhler, B*, Moon JD*, <u>Dey SK</u>, Jaffrey SR. **Detection of SARS-CoV-2 RNA using a DNA** aptamer mimic of green fluorescent protein. *ACS Chemical Biology*, 2022, 17(4), 840–853.

2. <u>Dey SK</u>, Filonov GS, Olarerin-George AO, Jackson BT, Finley LWS, Jaffrey SR. **Repurposing an adenine riboswitch into a fluorogenic imaging and sensing tag.** *Nature Chemical Biology*, 2022, 18 (2), 180-190.

3. Truong L, Kooshapur H, <u>Dey SK</u>, Li X, Tjandra N, Jaffrey SR, Ferré-D'Amaré AR. **The fluorescent** aptamer Squash extensively repurposes the adenine riboswitch fold. *Nature Chemical Biology*, 2022, 18 (2), 191-198.

4. Moon JD, Wu J, <u>Dey SK</u>, Litke JL, Li X, Kim H, Jaffrey SR. Naturally occurring three-way junctions can be repurposed as genetically encoded RNA-based sensors. *Cell Chemical Biology*, 2021, 28 (11), 1569-1580.

5. Li X, Mo L, Litke JL, <u>Dey SK</u>, Suter SR, Jaffrey SR. **Imaging Intracellular S-Adenosyl Methionine Dynamics in Live Mammalian Cells with a Genetically Encoded Red Fluorescent RNA-Based Sensor.** *Journal of the American Chemical Society*, 2020, 142 (33), 14117-14124. 6. <u>Dey SK</u>, Jaffrey SR. **RIBOTACs: Small Molecules Target RNA for Degradation.** *Cell Chemical Biology*, 2019, 26 (8), 1047-1049.

7. Fouz MF, <u>Dey SK</u>, Mukumoto, K, Matyjaszewski, K, Armitage, BA, Das SR. Accessibility of **Densely Localized DNA on Soft Polymer Nanoparticles.** *Langmuir*, 2018, 34 (49), 14731-14737.

8. <u>Dey SK</u>, Pettersson JR, Topacio AZ, Das SR, Peteanu LA. Eliminating Spurious Zero-Efficiency FRET States in Diffusion-Based Single-Molecule Confocal Microscopy. *Journal of Physical Chemistry Letters*, 2018, 9 (9), 2259–2265.

9. Ransey E, Paredes E, <u>Dey SK</u>, Das SR, Heroux A, Macbeth MR. Crystal structure of the Entamoeba histolytica RNA lariat debranching enzyme EhDbr1 reveals a catalytic Zn^{2+}/Mn^{2+} heterobinucleation. *FEBS Letters*, 2017, 591 (13), 2003–2010.

10. Mack S*, Fouz MF*, <u>Dey SK</u>*, Das SR. **Pseudo-ligandless Click Chemistry for Oligonucleotide Conjugation.** *Current Protocols in Chemical Biology*, 2016, 8, 83–95.

11. Averick SE*, <u>Dey SK</u>*, Grahacharya D, Matyjaszewski K, Das SR. Solid Phase Incorporation of an ATRP Initiator for Polymer-DNA Biohybrids. *Angewandte Chemie International Edition*, 2014, 53 (10), 2739-2744.

12. Tan X, <u>Dey SK</u>, Telmer C, Zhang X, Armitage BA, Bruchez MP. Aptamers Act as Activators for the Thrombin Mediated-Hydrolysis of Peptide Substrates. *ChemBioChem*, 2014, 15 (2), 205-208.

13. Averick SE*, Paredes E*, <u>Dey SK</u>*, Snyder KM, Tapinos N, Matyjaszewski K, Das SR. Autotransfecting Short Interfering RNA through Facile Covalent Polymer Escorts. *Journal of the American Chemical Society*, 2013, 135 (34), 12508-12511.

14. <u>Dey SK</u>, Paredes E, Evans M, Das, SR. **The Diverse Active Sites in Splicing, Debranching and microRNA Processing Around RNA Phosphodiester Bonds**. *From Nucleic Acid Sequences to Molecular Medicine*. Editors: Erdmann VA and Barciszewski J. Springer Verlag, 2012, 475-501.

Patents

1. Das SR, Averick SE, <u>Dey SK</u>, Matyjaszewski K. **Functionalized Polymer Hybrids**. US Patent # US 9,765,169 B2

2. Jaffrey SR, <u>Dey SK</u>. **RNA sequences that induce fluorescence of small molecule fluorophores, molecular complexes, sensors, and methods of use thereof**. Provisional US Patent application # 63/282,347.

Manuscripts in preparation

1. <u>Dey SK</u>, Wu J, Jaffrey SR. **Plug and play fluorophores for Squash aptamer allows mRNA imaging in multiple colors.** (Target journal: *Nature Communications*).

2. <u>Dey SK</u>, Pickering BF, Jaffrey SR. Simple and efficient RNA tagging and affinity purification with the FS2 tag. (Target journal: *Cell Chemical Biology*).

3. <u>Dey SK</u>, Mack S, Paredes E, Ransey E, Corbo R, Evans M, Macbeth M, VanDemark AP, Peteanu LA, Das SR. Backbone Branched RNA II: Lariat Debranching Enzyme Reponses to 2'-branch modifications. (Target journal: *Nucleic Acids Research*).

4. <u>Dey SK</u>*, Pettersson JR*, Sakipov S, Mack S, Zalewski J, VanDemark AP, Kurnikova M, Das SR, Peteanu LA. Backbone Branched RNA III: Conformational Analyses by Single-Molecule FRET and Molecular Dynamics Simulations (Target journal: *Nucleic Acids Research*).

Oral presentations

1. Dey SK. Biochemical and single molecule studies of backbone branched RNAs and the lariat debranching enzyme. National Centre for Biological Sciences, Dec 19th 2017, Bangalore, India.

2. Dey SK. Marriage of native chemical ligation and click chemistry for synthesis of peptideoligonucleotide conjugates and site-specific labeling of enzymes. Summer Seminar Series, Department of Chemistry, Carnegie Mellon University, August 1st 2013, Pittsburgh. PA.

3. Dey SK, Holtermann J, Gangel H, Gramlich M. Fast Relaxation Imaging: Heat Shock Response in living cells. Center for Physics of Living Cell (CPLC) Summer School, University of Illinois at Urbana Champaign, August 4th 2012, Champaign, IL.

Poster presentations

1. <u>Dey SK</u>, Jaffrey SR. **Repurposing riboswitch aptamers for RNA imaging and biosensor applications.** RNA Imaging and Intracellular Dynamics Workshop - Hosted by the NCI RNA Biology Initiative, NIH, April 26, 2022.

2. <u>Dey SK</u>, Peteanu LA, Das SR. Analysis of the lariat debranching enzyme (Dbr1p) using dualfluorescently labeled branched RNA substrates. Biophysical Society 60th Annual Meeting, March 2016, Los Angeles, CA.

3. <u>Dey SK</u>, Peteanu LA, Das SR. **Analysis of the debranching reaction with backbone-branched RNA substrates**. Rustbelt RNA Meeting, October 2015, Sandusky, OH.

4. <u>Dey SK</u>, Peteanu LA, Das SR. **Single Molecule Fluorescence Studies on Conformation of Backbone Branched RNA.** Rustbelt RNA Meeting, October 2014, Pittsburgh, PA.

5. <u>Dey SK</u>, Grahacharya D, Das SR. A general method for site-specific labeling and conjugation of enzymes - exemplified by the lariat debranching enzyme Dbr1p. Rustbelt RNA Meeting, October 2013, Cleveland, OH.

6. <u>Dey SK</u>, Averick SE, Paredes E, Matyjaszewski K, Das SR. **Autotransfecting siRNA through covalent polymer escorts**. Molecular Recognition in Biological Systems Strategic Strength Research Symposium (The Many Lives of RNA), October 2013, Amherst, NY.

7. <u>Dey SK</u>, Averick SE, Paredes E, Matyjaszewski K, Das SR. A self-transfecting siRNA-polymer hybrid nanomaterial. International Conference of RNA Nanotechnology and Therapeutics, April 2013, Lexington, KY.

8. <u>Dey SK</u>, Paredes E, Grahacharya D, Das SR. Solid phase synthesis of lariat RNAs for RNA interference. Rustbelt RNA Meeting, October 2012, Dayton, OH.

Honors and awards

- 1. Recipient of CSIR Shyamaprasad Mukherjee Fellowship (SPMF), 2009.
- 2. Secured 3rd rank in GATE, 2009 in Chemistry.
- 3. Received the **General Proficiency Medal, 2009** for **best academic performance** in Chemistry at IIT Kanpur.
- 4. Secured 3rd rank in JAM (Joint Admission test for Masters), 2007.
- 5. Secured 2nd rank in the B. Sc Chemistry (Hons), 2007 examination, University of Calcutta.

Teaching and mentoring

1. Graduate teaching assistant for 6 semesters in various courses including undergraduate level bioorganic chemistry and advanced organic chemistry lab.

2. Mentored three undergraduate and two new graduate students in research during PhD. One resulted in **authorship of an undergraduate in a publication**.

3. Mentored two undergraduates (summer project) and two graduate students (rotation project) in research during postdoctoral work. **One resulted in a first author paper of a rotation student**.

4. Assisted Dr. Subha R. Das in a course titled **Kitchen Chemistry Sessions** where concepts of chemistry were taught to **students of science**, **arts and business background** through food.