Tuhina Banerjee, Ph.D.

Department of Chemistry, Pittsburg State University. 1701 S Broadway, Pittsburg, KS 66762
Cell: (313) 530-4506. Email: tbanerjee@pittstate.edu

OBJECTIVE

An academic position in the area of biochemistry, molecular biology, structural biochemistry, protein folding, RNA folding, molecular pathogenesis of infectious diseases.

EXPERTISE

Biochemical basis of infectious diseases and drug design; Biochemistry and biopolymers; Transient RNA-Protein interactions; Molecular interactions in cancer metastasis; Integrative experimental approaches to investigate protein folding and misfolding.

EMPLOYMENT PROFILE

2016- Present: Adjunct Instructor and Research Scientist at the Department of Chemistry, Pittsburg State University, USA.

2013- 2016: Chemist I at the Department of Chemistry, Pittsburg State University, Kansas, USA.

2008 – 2013: Postdoctoral research associate at University of Central Florida, Orlando, Florida, USA.

2006 - 2007: Postdoctoral research associate at Wayne State University, Detroit, Michigan, USA.

EDUCATION

2001 - 2006 **Ph.D. in chemistry and Biochemistry** from Indian Institute of Technology-Bombay, India.
Thesis entitled "Protein–Solvent Interactions and Molten Globule Intermediates: A Biophysical Approach".
Thesis Advisor: Prof. Nand Kishore, Department of Chemistry, IIT-Bombay, India.

1999 - 2001 **M. Sc. Biochemistry,** Banaras Hindu University (BHU), Varanasi, India.

1996 - 1999 **B. Sc. Chemistry**, Banaras Hindu University (BHU), Varanasi, India.

PUBLICATIONS

A. Publications from Pittsburg State University

27. T. Shelby±, T. Banerjee±, I. Zegar and **S. Santra.** "Highly Sensitive, Engineered Magnetic Nanosensors to Study the Ambiguous Activity of Zika Virus". ***Scientific Reports*** **2017,** *7*, 7377. ±contributed equally.

26. T. Shelby, S. Sulthana, J. McAfee, T. Banerjee and **S. Santra.** "Foodborne Pathogens Screening Using Magneto-Fluorescent Nanosensor: Rapid Detection of E. coli O157:H7". ***JoVE*** **2017,** *127,* e55821.

25. B. Heckert, T. Banerjee, S. Sulthana, S. Naz, R. Alnasser, D. Thompson, G. Normand, J. Grimm, J. M. Perez and **S. Santra.** "Design and Synthesis of New Sulfur-Containing Hyperbranched Polymer and Theranostic Nanomaterials for Bimodal Imaging and Treatment of Cancer". ***ACS Macro Letters*** **2017,** *6,* 235-240

24. S. Naz, J. Beach, B. Heckert, T. Tummala, O. Pashchenko, T. Banerjee, **S. Santra.** "Cerium Oxide Nanoparticles: A "Radical" Approach to Neurodegenerative Disease Treatment". ***Nanomedicine*** **2017,** *12,* 545-553.

23. T. Banerjee, T. Shelby, **S. Santra.** "How nanosensors may detect pathogen contamination before it ever reaches the dinner table". ***Future Microbiology*** **2017,** *12,* 97-100.

22. T. Shelby±, **T. Banerjee±**, J. Kallu, S. Sulthana, I. Zegar, **Santra, S.** "Novel Magnetic Relaxation Nanosensors: An Unparalleled "Spin" on Influenza Diagnosis". ***Nanoscale*** **2016,** 8, 19605.

21. **T. Banerjee***, S. Sulthana., T. Shelby, B. Heckert J. Jewell, K. Woody, V. Karimnia, J. McAfee and S. Santra*.

Multiparametric Magneto-fluorescent Nanosensors for the Ultrasensitive Detection of *Escherichia coli* O157:H7.

ACS Infectious Disease, **2016,** *2,* 667-673. *co-corresponding author.

Highlighted in:

1. ***FOX 14 News Channel:*** http://www.fox14tv.com/story/33412276/pitt-state-researchers-develop-rapid-e-coli-detection.
   http://www.fourstateshomepage.com/news/new-pitt-state-research-could-help-shed-light-on-foodbourne-illness-bacteria
2. ACS Press release: https://www.acs.org/content/acs/en/pressroom/presspacs/2016/acs-presspac-september-21-2016/speedy-bacteria-detector-
3. New food Economy: http://newfoodeconomy.com/rapid-e-coli-detection/
4. Food Safety News: http://www.foodsafetynews.com/tag/tuhina-banerjee/#.V-3IWfkrLIU
5. Cosmos Magazine: https://cosmosmagazine.com/chemistry/a-quick-easy-test-for-e-coli-contamination
6. PSU press and media, PSU TV and KRPS Radio.

B. Publications from University of Central Florida, Wayne State and IIT-Bombay.

20. **T. Banerjee**, L Cilenti, M. Taylor, A Showman, SA. Tatulian, K. Teter. Thermal Unfolding of the Pertussis Toxin S1 Subunit Facilitates Toxin Translocation to the Cytosol by the Mechanism of Endoplasmic Reticulum-Associated Degradation. **Infection and Immunity, 2016**, 84, 3388-3398.

19. H Burress, M. Taylor, **T. Banerjee**, SA. Tatulian, K. Teter. "Co- and Post-Translocation Roles for Hsp90 in Cholera Intoxication". ***J. Biol. Chem*, 289, (2014),** 33644-33654.

18. **T. Banerjee,** M. Taylor, A. Serrano, S. A. Tatulian, K. Teter. ADP-Ribosylation Factor 6 acts as an allosteric activator for the folded but not disordered Cholera Toxin A1 Polypeptide **Molecular Microbiology, 94, (2014)** 898-912.

17. M. Taylor, H Burress, **T. Banerjee**, S. Ray, D. Curtis, SA. Tatulian, K. Teter. Substrate-induced unfolding of protein disulfide isomerase displaces the cholera toxin A1 subunit from its holotoxin ***PLoS Pathogens*** 2014, 10(2), e1003925.

16. S. Ray, M. Taylor, **T. Banerjee,** S. A. Tatulian, K. Teter. "Lipid rafts alter the stability and activity of the cholera toxin A_1 subunit". ***J. Biol.Chem*, 287, (2012)** 30395-30405.

15. N. Salim, R. Lamichhane, R. Zhao, **T. Banerjee,** J. Phillip, D. Rueda, A. L. Feig. "Thermodynamic and Kinetic Analysis of an RNA Kissing Interaction and Its Resolution into an Extended Duplex". ***Biophys. J*, 102, (2012)** 1097-1107.

14. M. Taylor, **T. Banerjee,** N. VanBennekom, K. Teter. "Detection of Toxin Translocation into the Host Cytosol by Surface Plasmon **Resonance**". ***J. Vis. Exp. (JOVE)* 59 (2012)** 3686, doi: 10.3791/3686.

13. M. Taylor, **T. Banerjee,** S. Ray, S. A. Tatulian, K. Teter. "Protein disulfide isomerase displaces the cholera toxin A1 subunit from the holotoxin without unfolding the A1 subunit". ***J. Biol.Chem* 286 (2011)** 22090-22100.

12. M. Taylor[±], **T. Banerjee[±]**, F. Navarro-Garcia, J. Huerta, S. Massey, M. Burlingame, A. H. Pande, SA Tatulian, K Teter. "A therapeutic chemical chaperone inhibits cholera intoxication and unfolding/translocation of the cholera toxin A1 subunit". ***PLoS One* 6 (2011)** 18825-18834. * ***Contributed equally.***

11. C. Kaittanis, **T. Banerjee**, S. Santra, O. J. Santiesteban, K. Teter, J. M. Perez. "Identification of Molecular-Mimicry-Based Ligands for Cholera Diagnostics using Magnetic Relaxation". ***Bioconjugate Chemistry* 16 (2011)** 307-314.

10. **T. Banerjee**, A. H. Pande, M. G. Jobling, M. Taylor, S. Massey, R. K. Holmes, S. A. Tatulian, K. Teter. "Contribution of subdomain structure to the thermal stability of the cholera toxin A1 subunit". ***Biochemistry* 49 (2010)** 8839.

9. S. Massey, **T. Banerjee**, A. H. Pande, M. Taylor, S. A. Tatulian, K. Teter. "Stabilization of the tertiary structure of the

cholera toxin A1 subunit inhibits toxin dislocation and cellular intoxication". ***J. Mol. Biol.*** **393 (2009)** 1083.

8. **T. Banerjee** and N. Kishore. "Insights into the Energetics and Mechanism Underlying the Interaction ofTetraethyl ammonium bromide with Proteins". ***J. Chem. Thermodyn.*** **40** (**2007**) 483-491.

7. **T. Banerjee**, S. K. Singh and N. Kishore. "Binding of Naproxen and Amitriltyline to Bovine Serum Albumin: Biophysical Aspects". ***J. Phys. Chem. B.*** **110** (**2006**) 24147-24156.

6. **T. Banerjee** and N. Kishore. "Binding of 8-anilinonaphthalene sulfonate to dimeric and tetrameric concanavalin A: Energetics and its implications on saccharide binding studied by isothermal titration calorimetry". ***J. Phys. Chem. B*** **110** (**2006**) 7022-7028.

5. **T. Banerjee** and N. Kishore. "Interactions of peptides and lysozyme with aqueous tetraethylammonium bromide at 298.15 K". ***J. Solution Chem.*** **35** (**2006**) 1389-1399.

4. **T. Banerjee** and N. Kishore. "2,2,2-Trifluoroethanol induced molten globule state of concanavalin A and energetics of ANS binding: Calorimetric and spectroscopic investigation". ***J. Phys. Chem. B*** **47** (**2005**) 22655-22662.

3. **T. Banerjee** and N. Kishore. "Does the anesthetic 2,2,2-trifluoroethanol interact with bovine serum albumin by direct binding or solvent mediated effects? A calorimetric and spectroscopic investigation". ***Biopolymers*** **78** (**2005**) 78-86.

2. **T. Banerjee** and N. Kishore. "Interactions of Some Amino Acids with Aqueous Tetraethyl ammonium bromide at T 298.15 K: A Volumetric Approach". ***J. Solution chem.*** **34** (**2005**) 137-153.

1. **T. Banerjee** and N. Kishore. "A Differential Scanning Calorimetric Study on the Irreversible Thermal Unfolding of Concanavalin A". ***Thermochimica Acta*** **411** (**2004**) 109-230.

Currently funded grant:

1. "Magnetic Resonance Nanosensors for the Rapid Diagnosis of Influenza", NIH, Parent R03, ID: 1 R03 AI132832-01. Role: Co-PI, $142,558.00, 2017-2019.

PENDING SUPPORTS *(Submitted grants with decision pending):*

1. "Multifunctional Magnetic Nanosensor for Rapid Diagnosis of Zika and Investigation of Viral Mechanisms Including Binding, Fusion and Antibody Responses", NIH, Parent R15, Role: Co-PI, $413,861.00, 2018-2021.

2. "Activatable magneto-fluorescent nanosensors for the rapid detection of food-, water- and blood-borne pathogens", NIH, Parent R03, Role: Co- PI, $137,356.00, 2018-2020.

TEACHING ACTIVITIES

(A) In Pittsburg State University.

CHEM 875: Advance Biochemistry

CHEM 475: Introduction to Biochemistry

CHEM 216: General Chemistry I Lab

AWARDS AND HONORS

2004 – 2004 Recipient of the ***Glaque Memorial Award*** for outstanding oral presentation, at the 59th calorimetric conference held at Santa Fe, New Mexico USA, 2004.

2003 - 2005 Awarded Senior Teaching Assistant Fellow, Indian Institute of Technology (IIT), Bombay, India.

2002 - 2003 Awarded national graduate fellowship (National Eligibility Test, NET).

2001 - 2003 Awarded Teaching Assistant Fellow, Indian Institute of Technology (IIT), Bombay, India.

2001 - 2002 Qualified Graduate Aptitude Test in Engineering (GATE) for national graduate fellowship.

SPECIFIC SKILLS AND PROFICIENCY

Hands-on experience with the following instruments and techniques….

❑ Fluorescence Activated Cell Sorting. ❑ ELISA. ❑ Confocal and Fluorescence Microscopy. ❑ Protein expression and purification. ❑ Affinity column chromatography. ❑ RNA*i*-based experiments. ❑ Luciferase reporter assays. ❑ Gel experiments. ❑ SDS-PAGE. ❑ Genomic DNA isolation, purification and transfection. ❑ PCR. ❑ Western Blotting. ❑ HPLC. ❑ Surface Plasmon Resonance (SPR). ❑ Isothermal Titration Calorimeter (ITC). ❑ Differential Scanning Calorimetry (DSC). ❑ Circular Dichroism (CD). ❑ Densimeter. ❑ Protein FT-IR. ❑ UV/Vis Spectroscopy. ❑ Fluorescence Spectrophotometer. ❑ Cell Culture Lab techniques and assays. ❑ Translocation and secretion assays. ❑ Assay developments.

PROFESSIONAL AFFILIATION

American Chemical Society

SELECTED CONFERENCE PROCEEDINGS AND PRESENTATIONS

15. "Magnetic nanosensor platform for the fast and accurate detection of bacterial contaminants in platelet concentrates". Wesley Brantley, Ren Bean, Tanuja Tummala, Tuhina Banerjee and Santimukul Santra. K-INBRE conference at Kansas City, MO, Jan 12-14, 2018.

14. Early detection of zika and dengue viruses with functionalized magnetic nanosensors". Oleksandra Pashchenko, Tyler Shelby, Tuhina Banerjee and Santimukul Santra. K-INBRE conference at Kansas City, MO, Jan 12-14, 2018.

13. "Dual modal Nanosensors for the Early Detection of Escherichia Coli O157:H7". Tuhina Banerjee, Shoukath Sulthana, Tyler Shelby, James Mcafee and Santimukul Santra. 253rd ACS National Meeting & Exposition, San Francisco, CA. Apr 2-6th, 2017

12. "Novel drug cocktail-carrying antioxidant nanoceria for the treatment of cancer. Shuguftha Naz, **Tuhina Banerjee**, Jyothi Kallu, Shoukath Sulthana, Filbert Totsingan, Richard Gross and Santimukul Santra **ACS Pentasectional**, Oklahoma Wesleyan University **April** 8th, 2016

11. "Novel Magnetic Relaxation Nanosensors: An Unparalleled "Spin" on Influenza Diagnosis" Tyler Shelby, **Tuhina Banerjee**, Jyothi Kallu, Irene Zegar, and Santimukul Santra **K-INBRE Conference, Capitol, Jan** 23-24th, 2016

10. "Hsp90 inhibitor carrying magnetic nanaotheranostics for the treatment of non-small cell lung cancer". Jyothi Kallu, **Tuhina Banerjee**, Shoukath Sulthana and Santimukul Santra. **ACS Midwest Regional Meeting**, Missouri Western State University, St. Joseph, MO, Oct 21-24th, **2015.**

9. Non-Small Cell Lung Cancer Treatment Using Hsp90 Inhibitor Carrying Magnetic Nanotheranostics". Jyothi Kallu, Kalee Woody, Tuhina Banerjee and Santimukul Santra. **Annual Capitol Research Summit**, Topeka, Feb 11-12th, **2015**

8. *"A Therapeutic Chemical Chaperone Inhibits Cholera Intoxication and Unfolding Translocation of the Cholera Toxin A1 Subunit"* **44th US-Japan Conference on Cholera and Bacterial Infections**, at San Diego, USA, 2009 (***Invited Talk***).

7. *"Thermodynamic and Kinetic Analysis of RNA-RNA Kissing Interaction and Strand displacement reaction"* **9th Annual Meeting of Michigan RNA Society** at University of Michigan, Ann Arbor, MI, USA, 2007 (***Invited Talk***).

6. *"Characterization of partially folded states of proteins by isothermal titration calorimetry and energetics of its binding with fluorescent probe ANS",* **Thermo International 2006** at Colorado, USA, July, 2006 (***Invited Talk***).

5. Paper presented on *"Calorimetry in understanding protein – solvent interactions and partially folded states"* **60th Calorimetry conference** at **NIST**, Gaithersburg MD, USA, June 2005 (***Invited Talk***).

4. *"Calorimetry of the Interactions of 2,2,2-Trifluoroethanol with Bovine Serum Albumin and Concanavalin A, and Conformational Characterization of the Protein Folding Intermediates"* **59th Calorimetry conference** at Santa Fe, New Mexico, USA, June 2004 (***Invited Talk***), received **Giaque Memorial Award.**

3. "*Irreversible thermal unfolding of concanavalin A*" **6th National Symposium of Chemical Research Society of India** at IIT Kanpur, India Feb, 2004 (***Invited Talk***).

2. *"Calorimetry of the Interactions of 2,2,2-Trifluoroethanol with Bovine Serum Albumin and Concanavalin A, and Conformational Characterization of the Protein Folding Intermediates"* **RSC- West India Section Students Symposium** at IIT Bombay, India, Sept 2004 **(Invited Talk)**.

1. *"Irreversible thermal unfolding of Concanavalin A and its interaction with 2,2,2-Trifluoroethanol calorimetric and spectroscopic studies"* **2nd Indian Symposium of Protein Society Protein Structure and Function** at IIT Bombay, India, Oct 2004 **(Invited Talk)**.

REFERENCES

1. **Prof. Ken Teter**, Ph. D. (Mentor, Postdoc)
   Associate Professor
   Burnett School of Biomedical Sciences
   University of Central Florida
   12722 Research Parkway
   Orlando, FL, 32826, USA
   Phone: 001-407-882-2248
   Email: Ken.Teter@ucf.edu

2. **Prof. Suren Tatulian**, Ph. D. (Postdoc Collaborator)
   Associate Professor
   Department of Physical Sciences
   University of Central Florida
   Orlando, FL, 32826, USA
   Phone: 001-407-823-6941
   Email: Suren.Tatulian@ucf.edu

3. **Prof. Nand Kishore**, Ph. D. (Supervisor, Ph.D.)
   Professor
   Department of Chemistry
   Indian Institute of Technology- Bombay
   Powai, Mumbai 400076. India
   Phone : 022-2576-7157
   Email: nandk@chem.iitb.ac.in