Meheli Ghosh

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ABOUT ME

Ph.D. candidate in Pharmaceutical Sciences with a strong foundation in formulation design, drug product development, and advanced drug delivery systems. Backed by multidisciplinary training in biotechnology and nanotechnology, I am passionate about advancing innovation in therapeutic platforms through collaborative and translational research. Past experiences include developing a wide range of drug delivery systems through collaborations across industry, NIH- and FDA-funded projects.

TECHNICAL SKILLS

Drug Delivery & Formulation: Drug-in-adhesive transdermal system, Micro-needle development, Nanoparticulate and microparticulate systems, Conventional semi-solid formulations (gels and creams).

Product Formulation Development: Preformulation and screening for transdermal feasibility, Stability Studies (ICH, IVRT and IVPT), Dissolution testing, Process optimization, DoE and QBD (JMP, Minitab).

Analytical Techniques: HPLC and UPLC (method development, optimization, and validation), UV Vis spectrophotometry, Fourier-transform infrared spectroscopy, Differential scanning calorimetry.

Formulation characterization: Dynamic light scattering (Zeta sizer), Rheology, Microscopy (optical, confocal microscopy, SEM), Texture analysis, Peel and shear testing, Histology and H&E staining.

Software Skills: Chem-Draw, SPSS, GraphPad prism, ImageJ, Chemicalize, Statistical analysis tools.

EDUCATION

Mercer University, College of Pharmacy — Started Aug. 2022 (CGPA 4.0/4.0)
Ph.D. Candidate, Pharmaceutical Sciences || **Advisor**: Prof. Ajay K. Banga

Central University of Gujarat (University Gold Medal) — Graduated Jun. 2021 (CGPA 10.0/10.0)
M.Sc. Nanotechnology || **Advisor**: Prof. Hitesh Kulhari

Bangalore University (Department Rank 1) — Graduated Jun. 2019 (CGPA 8.21/10.0)
B.Sc. Biotechnology || **Advisor**: Prof. Anurag P Srivastava

RESEARCH EXPERIENCE

U.S. Food and Drug Administration (FDA- Contract number 75F40123C00204)

- In vitro tests to support bioequivalence determination when generic dermatological formulation has differences from the brand product formulation.
  - Worked on formulating topical gels, conducting Q3 characterization tests (rheological tests, texture analysis, pH, microscopic evaluations), and development of IVRT and IVPT methods, managed monthly technical updates and communications, analyzed and interpreted data; authored and reviewed technical reports and presentations.
- Investigating Q1 and Q2 variations in inactive ingredients and their effect on the Q3 and performance of topical emulsions (creams and lotions).
  - Led a team of four colleagues, for formulating topical creams, Q1 Q2 formulation + process optimization, conducting Q3 characterization tests (rheological tests, texture analysis, pH, microscopic evaluations), and development of IVRT and IVPT methods, managed monthly technical updates and communications, analyzed and interpreted data; authored and reviewed technical reports and presentations.

U01 Grant funded by NIH/NIAMS (U01AR078544)

- Sustained Delivery of 4-Phenylbutyric acid (4-PBA) through Chitosan Nanoparticles in Foam Formulation for Decontamination and Treatment of Chemical Warfare Agent-Induced Skin Injury.
  - Formulated and characterized 4-PBA-loaded chitosan nanoparticles and incorporated these in a foam formulation.
  - Compared two different molecular weights of chitosan on the formation of 4-PBA-loaded chitosan nanoparticles and their effect on the release (IVRT) and delivery (IVPT) of 4-PBA for up to 24 hours.
  - Tested the efficacy of the foam formulation with or without the nanoparticles in decontamination of lewisite from skin.
- Development of 4-Phenylbutyric acid-loaded emulsomes embedded in foam for the decontamination and treatment of lewisite-based skin injury.
  - Formulated and characterized novel 4-PBA-loaded emulsomes and incorporated these in a foam formulation.
  - Tested the efficacy of the foam formulation with or without the 4-PBA loaded emulsomes in decontamination of the lewisite from the skin.

- Development of 4-phenylbutyric acid microsponge gel formulations for the treatment of lewisite-mediated skin injury.
  - 4-PBA loaded eudragit RS100 microsponges were developed, characterized, and incorporated in gel formulation.
  - Two gelling agents, carbopol and carboxymethylcellulose were compared on the formulation of the gels, characterizations (rheological tests, texture analysis, pH, microscopic evaluations), and the release (IVRT) and delivery (IVPT) of 4-PBA for up to 24 hours.
- Follicular delivery of 4-phenylbutyric acid PLGA nanoparticles to mitigate chemical warfare agent-induced skin injury: a quality by design approach.
  - Formulation and characterization of 4-phenyl butyric acid loaded PLGA nanoparticles using DOE and analyzing their deposition in the hair follicles using differential tape stripping in full-thickness porcine skin (after IVPT).
- Conducted stability studies following ICH guidelines to compare the micro/nanoparticulate systems.
  - Accelerated stability studies for 6 months are being conducted on all the nano/microparticulate systems for 4-PBA delivery following ICH guidelines to compare the formulations.

Merck Group

- Fabricated drug-loaded microneedles for three-day transdermal delivery of palonosetron hydrochloride using a novel method of vacuum compression molding.
  - Fabricated microneedles for palonosetron hydrochloride using vacuum compression molding: this is the first work to develop drug-loaded microneedles using this technique.
  - Used multiple PVA polymers for the formulation of the microneedles, and their effect on the formation of the microneedles, as well as the release (IVRT) and delivery (IVPT) of palonosetron hydrochloride for up to 3 days, were tested.
  - Characterization of fabricated microneedles using SEM, confocal, histology, FTIR, DSC, and Texture analysis (height reduction upon exposure to force).
- Formulation and skin delivery of quercetin-loaded PAMAM dendrimer-based gel for potential anti-inflammatory and antioxidant effect.
  - Formulated and characterized quercetin-loaded PAMAM dendrimers and incorporated these in a PVA gel.
  - Compared three different generations of PAMAM dendrimer on the formation of quercetin-loaded nanoparticles and their effect on the release (IVRT) and delivery (IVPT) of quercetin for up to 24 hours.
- Transdermal delivery of methotrexate via hydrogel-based iontophoretic patch.
  - Formulation and characterization of various methotrexate hydrogels.
  - Investigation of iontophoresis as physical enhancement technique for methotrexate delivery across skin from hydrogels.
  - Methotrexate hydrogel-based iontophoretic patch developed and tested.
- Curcumin and Mefenamic acid patch development for pain relief during the menstrual cycle in women.
  - Development of a patch with dual drug delivery mechanism.
  - Utilized HPLC, skin barrier testing, characterization, and permeation testing.

Additional Academic Projects

- Formulation and Evaluation of a Transdermal Drug-In-Adhesive Patch for Lamotrigine Delivery in Potential Epilepsy Treatment.
  - Evaluated the transdermal delivery of lamotrigine with different classes of chemical enhancers.
  - Formulated and developed transdermal delivery systems using different pressure-sensitive adhesives.
  - Characterized the patch using tack, peel, and shear testing.
- Impact of mixing adhesives in the formulation and evaluation of drug-in-adhesive patch for lidocaine: A dot matrix technology.
  - Supervised junior Ph.D. student in evaluating the transdermal delivery of lidocaine with different chemical enhancers.
  - Formulation and development of transdermal delivery systems using different pressure-sensitive adhesives.
  - Comparing the effect the mixing silicone and acrylate pressure-sensitive adhesives on the release (IVRT) and delivery (IVPT) of lidocaine for up to 7 days.
- Developing and Evaluating a Three-Day Continuous Transdermal Delivery System of Lenvatinib Mesylate for Potential Cancer treatment.
  - Advisory role as a senior student in pre-formulation-HPLC method development and validation, and saturation solubility determination of Lenvatinib mesylate in different vehicles.
  - Investigation of iontophoresis as physical enhancement technique for methotrexate delivery across skin from hydrogels.
  - Evaluating the transdermal delivery of Lenvatinib mesylate with different classes of chemical enhancers.

SELECTED PUBLICATIONS

- **Ghosh, M.**, & Banga, A. K. (2025). Formulation and evaluation of a Transdermal Drug-In-Adhesive patch for lamotrigine delivery in potential epilepsy treatment. *Journal of Drug Delivery Science and Technology, 107067.* https://doi.org/10.1016/j.jddst.2025.107067
- **Ghosh, M.**, Viswaroopan, N., Kshirsagar, S. M., Khan, J., Mohiuddin, S., Srivastava, R. K., Athar, M., & Banga, A. K. (2025). Sustained delivery of 4-phenylbutyric acid via chitosan nanoparticles in foam for decontamination and treatment of lewisite-mediated skin injury. *International Journal of Pharmaceutics, 682, 125928.* https://doi.org/10.1016/j.ijpharm.2025.125928
- Kshirsagar, S., Viswaroopan, N., **Ghosh, M.**, Junaid, M. S. A., Haque, S., Khan, J., Muzaffar, S., Srivastava, R. K., Athar, M., & Banga, A. K. (2024). Development of 4-phenylbutyric acid microsponge gel formulations for the treatment of lewisite-mediated skin injury. *Drug Delivery and Translational Research, 15(2), 638–654.* https://doi.org/10.1007/s13346-024-01620-y
- Bhattaccharjee, S., Junaid, A., **Ghosh, M.**, Srivastava, R., Athar, M., & Banga, A. K. (2025). Topical foam for simultaneous treatment and decontamination of chemical warfare agents on dermal exposure. *AAPS PharmSciTech, 26(6).* https://doi.org/10.1208/s12249-025-03177-6
- **Ghosh, M.**, Hazarika, P., Dhanya, S., Pooja, D., & Kulhari, H. (2023). Exploration of sialic acid receptors as a potential target for cancer treatment: A comprehensive review. *International Journal of Biological Macromolecules, 257, 128415.* https://doi.org/10.1016/j.ijbiomac.2023.128415
- Jangid, A., Solanki, R., **Ghosh, M.**, Jadav, M., Patel, S., Pooja, D., & Kulhari, H. (2023). Phenylboronic acid conjugated PAMAM G4 dendrimers augmented usnic acid delivery to gastric cancer cells. *European Polymer Journal, 192, 112073.* https://doi.org/10.1016/j.eurpolymj.2023.112073

Under Preparation/Submitted - First Authored

- Fabricated drug-loaded microneedles for three-day transdermal delivery of palonosetron hydrochloride using a novel method of vacuum compression molding.
- Development of 4-phenylbutyric acid-loaded emulsomes embedded in foam for the decontamination and treatment of lewisite-based skin injury.
- Formulation and skin delivery of quercetin loaded PAMAM dendrimer-based gel for potential anti-inflammatory and antioxidant effect.

AWARDS/HONORS

- Received the **Excellent Topical Innovation Award** at the Topical Products Conference hosted by Topical Product Testing LLC for my work on a novel technique in formulating drug-loaded microneedles.[link]
- Received the **Love of Learning award** (USD 1000) by Phi Kappa Phi Honor Society in 2024.[link]
- Awarded the **Best Poster Presentation** at the Controlled Release Society Conference in 2023.[link]
- Among **Top 3 Best Poster** Presentations at the CDR 2024 conference
- Invited member of Phi Kappa Phi Honor Society since 2022 for - **Top 10%** of graduate students.
- **University Gold Medal** for receiving a perfect 10 GPA and **topped** the entire central university, in M.Sc. Nanotechnology.
- Cleared extremely prestigious national level exams - *Tata Institute of Fundamental Research GS-2019 (Biology - TIFR16874)*, and *Central Universities Common Entrance Test 2019*.
- Received the **Institute Creams Award** (award for overall excellence) and a university fellowship that waived off 50% of my undergraduate tuition fee (2019).

INTERNSHIPS/SERVICES

- Graduate research assistant, Mercer University, Atlanta, GA. [August 2022 - Present]
  - Mentored several research elective students, summer interns, and junior Ph.D. students in the lab.
  - Lead TA for the dispensing lab of PharmD consisting of the preparation of various pharmaceutical dosage forms and training PharmD students in a variety of lab techniques.
  - Took lectures for Pharm.D. students and led multiple lab and industry collaborative projects with junior Ph.D. students.
- Research assistant at IIT RAM. [July 2021 - March 2022]

  - Worked on formulation and characterization of drug-loaded ionic liquids.
  - Wrote a grant proposal to the Department of Science and Technology, India on "Studying structure and properties of Metal and Metal Oxide Nanoparticles capped with nutraceutical molecule and its Biological Applications".
  - Academic research, teaching, and management for undergraduate students.
- Summer Research Fellow at CSIR- NEIST, India. [July 2020 – September 2020]
- Research Intern at Institute of Nano Science and Technology (INST), Mohali. [May 2020 – July 2020]
- **Abstract Screener** for American Association of Pharmaceutical Scientists Annual Conference.
- Mercer University, Atlanta, GA.
  - Social Media Ambassador (September 2023 - June 2024).
  - Senior Content Manager (September 2024 - Present).
  - Toastmasters International - Sergeant at Arms (June 2024 - Present).
  - Public relations officer (October 2022 - September 2023), Secretary (October 2023 - September 2024) and Chair-elect (October 2024 – Present)- Mercer University Student Chapter of AAPS.
- Topical and Transdermal Community - AAPS.
  - Student engagement member (October 2023 - September 2024)
  - Member engagement managers (October 2024 - Present)

SELECTED ABSTRACT/POSTER PRESENTATIONS

- **Meheli Ghosh**, and Ajay K. Banga (2023, April 15th). Enhancing Transdermal Delivery of Lamotrigine for Improved Epilepsy Treatment. Poster session presented at the Atlanta research conference at Mercer University, GA.
- **Meheli Ghosh**, and Ajay K. Banga (2023, July 24-28). Enhancing Transdermal Delivery of Lamotrigine for Improved Epilepsy Treatment. Poster session presented at the Controlled Release Society, Las Vegas, NV.
- **Meheli Ghosh**, and Ajay K. Banga (2023, October 22-25). Developing and evaluating a transdermal patch of lamotrigine for potential epilepsy treatment. Poster session presented at the American Association of Pharmaceutical Scientists Annual Meeting, Orlando, FL.
- **Meheli Ghosh**, and Ajay K. Banga (2023, October 27). Developing and evaluating a transdermal patch of lamotrigine for potential epilepsy treatment. Poster session presented at the MUSM Joint Research Conference, Mercer University, Atlanta, GA.
- **Meheli Ghosh**, and Ajay K. Banga (2024, February 28-March 1). Developing and evaluating a transdermal patch of lamotrigine for potential epilepsy treatment. Poster session presented at the Southeast Georgia CTSA conference, Callaway Gardens, GA.
- **Meheli Ghosh**, and Ajay K. Banga (2024, April 6th). Developing and evaluating a transdermal patch of lamotrigine for potential epilepsy treatment. Poster session presented at the Atlanta research conference at Mercer University, GA.
- **Meheli Ghosh**, Nethra Viswaroopan, Sharvari Kshirsagar, Ritesh Kumar Srivastava, Mohammad Athar, Ajay K. Banga (2024, June 3-5). Topical and transdermal delivery of 4-phenylbutyric acid through chitosan nanoparticles dispersed in a Foam formulation: a potential antidote for skin injury due to chemical warfare agents. Poster session presented at the 17th Annual CounterACT Symposium meeting, Salt Lake City, UT.
- **Meheli Ghosh**, Nethra Viswaroopan, Sharvari Kshirsagar, Ritesh Kumar Srivastava, Mohammad Athar, Ajay K. Banga (2024, September 24th). Topical and transdermal delivery of 4-phenylbutyric acid through chitosan nanoparticles dispersed in a Foam formulation: a potential antidote for skin injury due to chemical warfare agents. Poster session presented at the Center for Dermal Research, Rutgers University.
- **Meheli Ghosh**, Nethra Viswaroopan, Sharvari Kshirsagar, Ritesh Kumar Srivastava, Mohammad Athar, Ajay K. Banga (2024, October 20-24). Topical and transdermal delivery of 4-phenylbutyric acid through chitosan nanoparticles dispersed in a Foam formulation: a potential antidote for skin injury due to chemical warfare agents. Poster session presented at the American Association of Pharmaceutical Scientists Annual Meeting, Salt Lake City, UT.
- **Meheli Ghosh**, Thomas Kipping, and Ajay K. Banga (2024, October 20-24). Formulation and skin delivery of quercetin loaded PAMAM dendrimer-based gel for potential anti-inflammatory and antioxidant effect. Poster session presented at the American Association of Pharmaceutical Scientists Annual Meeting, Salt Lake City, UT.
- **Meheli Ghosh**, Sharvari M. Kshirsagar, Thomas Kipping, and Ajay K. Banga (2024, October 20-24). Vacuum Compression Molding: a Novel Method to Fabricate Drug-Loaded Microneedles for Three-Day Transdermal Delivery of Palonosetron Hydrochloride. Poster session presented at the American Association of Pharmaceutical Scientists Annual Meeting, Salt Lake City, UT.
- **Meheli Ghosh**, Nethra Viswaroopan, Sharvari Kshirsagar, Ritesh Kumar Srivastava, Mohammad Athar, Ajay K. Banga (2024, October 25th). Topical and transdermal delivery of 4-phenylbutyric acid through chitosan nanoparticles dispersed in a Foam formulation: a potential antidote for skin injury due to chemical warfare agents. Poster session presented at the MUSM Joint Research Conference, Mercer University, Atlanta, GA.

CURRENT MENTEES

Srushti Mukkirwar (PhD Student, Mercer University) January 2025 - Present

Chamundeswara Srinivasa Akash Kalla (PhD Student, Mercer University) January 2024 - Present