

Meheli Ghosh

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ABOUT ME

Ph.D. Candidate in Pharmaceutical Sciences with 5+ years of experience in formulation and process development, drug product characterization, and advanced delivery systems. Skilled in developing complex dosage forms under GMP/GLP practices, conducting stability studies (ICH/USP/EP), and applying DoE/QbD approaches for process optimization. Proficient in analytical and biophysical techniques (HPLC/UPLC, DSC, FTIR, DLS, rheology, microscopy) with experience assessing drug physicochemical properties. Demonstrated ability to lead cross-functional teams, deliver on industry, FDA/NIH-funded projects, and supervise junior scientists. With a multidisciplinary background in biotechnology and nanotechnology, I bring a strong foundation to apply expertise in biopharmaceutical formulation and characterization to advance patient-centric therapies.

TECHNICAL SKILLS

Drug Delivery & Formulation: Drug-in-adhesive patches, Microneedle based drug device, Nanoparticles, microparticles, microemulsion, Conventional semi-solid formulations (gels, foams, ointments and creams), physicochemical profiling, Foundational knowledge in sterile and oral formulations.

Product Formulation Development: Preformulation and excipient screening, Process optimization, DoE and QBD (JMP, Minitab), Sterile/aseptic practices, Stability Studies (accelerated following ICH guidelines), IVRT and IVPT, Dissolution testing.

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

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

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

Cross-Functional & Project Leadership: Led **FDA- and NIH-collaborative projects**; supervised interns and junior researchers; managed multi-team project deliverables, and regulatory documentation (SOPs, validation reports, technical protocols, GLP, cGMP compliance).

EDUCATION

Mercer University, College of Pharmacy Ph.D. Candidate, Pharmaceutical Sciences Advisor: Prof. Ajay K. Banga	Started Aug. 2022 (GPA 4.0/4.0)
Central University of Gujarat (University Gold Medal) M.Sc. Nanotechnology Advisor: Prof. Hitesh Kulhari	Graduated Jun. 2021 (GPA 4.0/4.0)
Bangalore University (Department Rank 1) B.Sc. Biotechnology Advisor: Prof. Anurag P Srivastava	Graduated Jun. 2019 (GPA 8.21/10.0)

RESEARCH EXPERIENCE

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

- In vitro tests to support bioequivalence determination when the generic dermatological formulation (gels and creams) has differences from the brand product formulation: performance evaluation by release and permeation testing.
 - Q1 Q2 formulation + process optimization, process validation, Q3 characterization: rheology, texture analysis, etc.
 - Led a team of 4 colleagues, FDA process and data documentation, report writing, SOPs, monthly data presentations.

U01 Grant funded by NIH/NIAMS (U01AR078544)

- Development of 5+ polymeric and lipid nanoparticle/microparticle systems for sustained delivery of 4-Phenylbutyric acid for decontamination and treatment of chemical Warfare agent-induced Skin injury.
 - Screened multiple polymers (Chitosan, PLGA, Eudragit RS100, Soya lecithin) for nanoparticle formulation, selecting promising leads for further preclinical evaluation.
 - Utilized DoE, Quality-by-Design for process optimization and targeted drug delivery.
 - Utilized HPLC, FTIR, DLS (particle size and zeta potential), DSC, SEM, stability testing (accelerated for 6 months following ICH guidelines), release and permeation testing.
 - Led a team of 3 colleagues, collaborated with cross-disciplinary teams and delivered annual NIH reports.

Merck KGaA

- Developed and characterized novel device-based formulations (microneedles, iontophoretic hydrogels, PA-MAM dendrimer based gels, dual-drug patches) for enhanced transdermal and topical delivery.
 - Fabricated long-acting microneedles using a novel vacuum compression molding technique; screened several PVA grades and optimizing polymer/API interactions for thermal stability.
 - Characterized formulations with HPLC, DSC, FTIR, SEM, confocal microscopy, histology, stability studies, release (IVRT), and permeation (IVPT).
 - Investigation of iontophoresis as physical enhancement technique for methotrexate delivery across skin from hydrogels.
 - Compared three different generations of PAMAM dendrimer on the development of quercetin-loaded nanoparticles and their effect on the characterization (particle size, DSC, FTIR, SEM), release and permeation of quercetin.
 - Designed a dual-drug transdermal patch (curcumin + mefenamic acid) and assessed performance via skin barrier testing and permeation assays.

Additional Academic Projects

- Formulation and Evaluation of a Drug-In-Adhesive Patch for Lamotrigine Delivery in Potential Epilepsy Treatment.
 - Preformulation, Screening of chemical enhancers and 3 different pressure-sensitive adhesives (Polyisobutylene, acrylate and silicone) for transdermal patch formulation.
 - Utilized HPLC, structure elucidation (FTIR), thermal techniques (DSC), logP determination, texture analysis, 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.
 - Formulation + process optimization sustained transdermal delivery for up to 1 week.
 - Supervised a junior PhD student in investigating the impact of mixing silicone and acrylate adhesives on drug release and patch characterization.
- Developing and Evaluating a Three-Day controlled 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.

SELECTED PUBLICATIONS

- Ghosh, M., Kshirsagar, S. M., Kipping, T., & Banga, A. K. (2025). Vacuum compression-molded polyvinyl alcohol microneedles for sustained three-day transdermal delivery of palonosetron hydrochloride. *Drug Delivery and Translational Research*. <https://doi.org/10.1007/s13346-025-01980-z>
- 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>
- Bhattacharjee, 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>

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.

- 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 Dreams Award** (award for overall excellence) and a university fellowship that waived off 50% of my undergraduate tuition fee (2019).

INTERNSHIPS/SERVICES/LEADERSHIP ROLES

- Graduate research assistant, Mercer University, Atlanta, GA. [August 2022 - Present]
- Research assistant at IIT RAM. [July 2021 - March 2022]
- 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.[2023-Present]
- Mercer University, Atlanta, GA (Student Ambassador [2023-2024], Senior Student Ambassador [2024-Present]).
- AAPS Topical & Transdermal Community (Student engagement member [2023-2024], and Member engagement manager [2024-Present]).
- Mercer University student chapter of AAPS- (Public relations officer [2022-2023], Secretary [2023-2024], Chair elect [2024-Present]).

SELECTED ABSTRACT/POSTER PRESENTATIONS

Presented 15+ research posters at international meetings (American Association of Pharmaceutical Scientists (AAPS) and Controlled Release Society (CRS), Drug Delivery and Formulations (DDF)) and various national/regional meetings, some of which are:

- **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**, 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 (2025, September 15-16). Sustained delivery of 4-phenylbutyric acid via chitosan nanoparticles in foam for decontamination and treatment of lewisite-mediated skin injury. Poster session presented at the DDF Summit, Boston, MA.

CURRENT MENTEES

Srushti Mukkirwar (PhD Student, Mercer University)

January 2025 - Present

Chamundeswara Srinivasa Akash Kalla (PhD Student, Mercer University)

January 2024 - Present