2027 Summer Research Project

Section	Description
Project title	Nose-to-Brain Delivery of Antibacterial Agents Using Sol-Gel Biomaterials – a Platform for Treating Life-Critical Infections of the Central Nervous System
Hours & delivery	**Duration:** 11 January to 19 February 2027. **Hours**: 30-35 hours/week **Delivery mode:** On-campus **Location:** School of Pharmacy and Pharmaceutical Sciences, Dutton Park.
About the project (150–250 words)	Infection affecting the central nervous system can be critical/life-threatening and are difficult to treat because many medicines struggle to reach the brain effectively, and sustainably. One promising approach is nose-to-brain drug delivery, offering a non-invasive pathway for transporting therapeutics directly to the brain. This project will explore the use of biocompatible sol-gel formulations as carriers for antibacterial agents designed for nose-to-brain delivery. During this six-week project, students will gain hands-on experience in preparing prototype sol-gel formulations and evaluating their antibacterial performance. The project focuses on fundamental laboratory techniques that support development of innovative drug delivery systems for infectious disease applications where significant unmet clinical need exists. Students will contribute to formulation preparation, laboratory testing, and interpretation of results. The project provides an introduction to biomaterials research and drug delivery science while offering insight into how novel therapeutic technologies are developed. By the end of the project, students will have a better understanding of the challenges associated with delivering medicines to the brain and the role biomaterials can play in addressing these challenges.
What you'll do (100-150 words)	Students will participate in a range of laboratory-based research activities, including: • Preparing and optimizing simple sol-gel biomaterial formulations. • Incorporating antibacterial agents into the formulations. • Conducting antibacterial testing using zone of inhibition (ZOI) assays. • Recording, organising, and analysing experimental data. • Participating in regular discussions with the research team. • Summarising findings and presenting outcomes at the completion of the project. The project is designed to provide practical exposure to early-stage biomaterials and drug delivery research while developing confidence working in a fast-paced laboratory environment.
What you'll learn (100–150 words)	Students will gain practical experience in biomaterials and pharmaceutical research, particularly in the development of drug delivery systems. They will learn how to prepare and characterise basic sol-gel formulations, perform antibacterial assays, maintain laboratory records, and analyse experimental results.

	The project will also help students develop broader research skills, including scientific problem-solving, critical thinking, data interpretation, teamwork, and scientific communication. Students will gain insight into translational research and how emerging biomaterial technologies can be applied to address challenges in infectious disease treatment. These experiences will provide a strong foundation for students interested in pursuing future research opportunities in biomedical engineering, pharmacy, biotechnology, or related disciplines.
Project outcomes (75–125 words)	□ Preparation of antibacterial sol-gel biomaterial formulations. □ Evaluation of antibacterial activity using zone of inhibition (ZOI) assays. □ Collection, analysis, and interpretation of experimental data. □ Identification of formulation characteristics that influence antibacterial performance. □ Development of practical laboratory and research skills in biomaterials and drug delivery. □ Preparation of a short summary report and/or presentation of project findings. □ Generation of preliminary data that may contribute to ongoing research in nose-to-brain drug delivery for infectious diseases.
Who should apply? (75–125 words)	This project is suitable for motivated students with a keen interest in working within a dynamic research environment. Students studying biomedical engineering, pharmaceutical sciences, pharmacy, biotechnology, biomedical science, chemistry, or related disciplines are encouraged to apply. No prior research experience is required; however, enthusiasm for laboratory work and a genuine interest in antibacterial therapies, biomaterials, and drug delivery systems will be highly valued. Students who are organised, curious, willing to learn new techniques, and able to work both independently and as part of a team will be well suited to this project
Team & supervision (75–125 words)	1. Dr. Anjana Jayasree, Postdoctoral Researcher, School of Pharmacy and Pharmaceutical Sciences, UQ 2. Dr Preeti Pandey, Honorary Research Fellow, School of Pharmacy and Pharmaceutical Sciences, UQ 3. Associate Professor Harendra Parekh, School of Pharmacy and Pharmaceutical Sciences, UQ
Additional opportunities (optional)	Students may have the opportunity to present their findings to the research team and engage with postgraduate and early-career researchers working in related areas. Participation in the project may provide pathways to future research projects, honours studies, or ongoing involvement in biomaterials and drug delivery research programs.
Additional requirements (if applicable)	Students must be willing to undertake laboratory-based work and follow all laboratory safety and training requirements. Appropriate laboratory induction and supervision will be provided before project activities commence.
Contact	Yes, students may contact the supervisor before applying. Direct enquiries to: a.jayasree@uq.edu.au