Engineering and biomanufacturing of antibody conjugated biomolecules

Record number : OPR-1154

Overview

RESEARCH DIRECTION

Sangamithirai Subramanian Parimalam, Professeure - Department of Chemical and Biotechnological Engineering

INFORMATION

sangamithirai.subramanian.parimalam@usherbrooke.ca

ADMINISTRATIVE UNIT(S)

Faculté de génie
Département de génie chimique et de génie biotechnologique

LEVEL(S)

2e cycle
3e cycle

LOCATION(S)

Campus principal

Project Description

Context: The importance to develop versatile bioprocess strategies to produce novel biomolecules particularly antibody conjugated biomolecules is increasingly critical in addressing evolving health threats, including antimicrobial resistance (AMR), cancer, and infectious diseases. These conditions often develop resistance to existing treatments, underscoring the urgent need for adaptable bioprocesses capable of accommodating new target biomolecules. Monoclonal antibody therapy has long been a complementary therapy in cancer treatment in conjunction with traditional therapies like chemotherapy. In recent decades, antibody-drug conjugates (ADCs) have transformed cancer care by allowing the direct delivery of cytotoxic agents specifically to cancer cells, thereby enhancing treatment efficacy while minimizing side effects. In this context, the parallel advancement of bioprocessing techniques is essential for development, production and optimization of the biomolecules. In this research project, we aim to create advanced biotechnology approaches to develop novel biomolecules. By leveraging antibodies as core component, we plan to design innovative processes that incorporate multimodal moieties. This approach has a potential to significantly enhance the production of more effective biomolecules for the treatment of these diseases in the long term.

Objective: Designing and engineering monoclonal antibody conjugated biomolecules with enhanced stability, cellular uptake and functional efficacy. This will be achieved through the development and optimization of bioprocesses that ensure high-efficiency conjugation, scalability, and reproducibility in the production of antibody-biomolecule conjugates (ABCs).

Methodology:
1. Screening and Optimization: Systematically screen a range of monoclonal antibodies, cross-linkers, and biomolecules to optimize crosslinking reactions, aiming to improve conjugation efficiency, stability, and bioactivity of the ABCs.
2. Scalable Bioprocess Development: Develop and optimize scalable bioprocesses for the production of ABCs, ensuring high yield, reproducibility, and process efficiency.
3. Characterization of Physicochemical Properties: Characterize the physicochemical properties of the engineered biomolecules, including molecular weight, solubility, aggregation, glycosylation, and binding affinity, to assess their suitability for biological applications.
4. Biocompatibility and Toxicity Evaluation: Evaluate the biocompatibility and toxicity of the conjugated biomolecules using cellular assays to ensure their safety and functional efficacy.

Eligibility Requirements: We are seeking highly motivated students with an educational background in Biotechnology, Chemical Engineering, Biomedical Engineering, Molecular Biology or other related domains to apply. While prior research experience is desirable, it is not a mandatory requirement. The ideal candidates will demonstrate strong scientific competence, along with excellent collaborative, communication, and problem-solving skills. This project is open to both Master's and Doctoral students.

Discipline(s) by sector

Sciences naturelles et génie

Génie chimique

Funding offered

To be discussed

The last update was on 12 February 2025. The University reserves the right to modify its projects without notice.