Implementing iPSC technology in engineering myeloid-cell based immunotherapies

Planned activities at the Cellular Immunology Laboratory, ICGEB Trieste (3 months)

I am a PhD student in Animal and Human Physiology at the Faculty of Biology, University of Belgrade, and a Junior Research Assistant at the Institute for the Application of Nuclear Energy (INEP) in a Group for Immunology, Cell Biology and Nanomedicine. My current work is focused on human induced pluripotent stem cell (iPSC)-derived myeloid cells and their role in immune regulation, with particular interest in the development of cell-based immunotherapies for autoimmune diseases and cancer. Within my doctoral thesis and ongoing projects, I am establishing protocols for the generation and functional characterization of human iPSC-derived myeloid cells.

The main goal of my planned three-month research stay in the laboratory of Dr. Federica Benvenuti at ICGEB is to acquire hands-on experience in mouse iPSC technology and mouse iPSC-derived myeloid cells. While my current expertise is predominantly in human systems, I consider it essential for my future development to understand how iPSC-based approaches are implemented in mouse models, where preclinical testing are most often performed. The combination of my human iPSC and myeloid background with structured training in mouse iPSC will significantly strengthen the translational dimension of my research.

During this visit, I aim to:

- Learn protocols for the generation, expansion and maintenance of mouse iPSC lines under controlled culture conditions.
- Become familiar with differentiation strategies that drive mouse iPSC toward myeloid lineages, including dendritic cell-like populations (in particular cDC1) and suppressive/regulatory myeloid phenotypes.
- Gain practical experience in the phenotypic and functional characterization of mouse iPSC-derived myeloid cells.
- Understand how mouse iPSC-derived cells are integrated into in vivo cancer models, and how data from these systems are analysed and interpreted.
- Transfer this knowledge to my home institution, where it can be adapted and combined with ongoing work on human iPSC-derived myeloid cells.

Detailed schedule will be aligned with the current work of the host laboratory, but the planned activities can be organized as follows:

Month 1: Mouse iPSC culture

- Training in thawing, plating, passaging and cryopreservation of mouse iPSC under feeder or feeder-free conditions, with attention to maintaining pluripotency and genomic stability.
- Learning how to adjust culture conditions to support healthy, homogeneous mouse iPSC cultures suitable for downstream differentiation.
- Discussions with host researchers about similarities and differences between human and mouse iPSC workflows, and how these differences impact experimental design.

Month 2: Differentiation into myeloid lineages

- Participation in differentiation experiments guiding mouse iPSC toward myeloid cell fates using defined cytokine combinations and stepwise culture systems.
- Learning how to design and apply flow cytometry panels to identify myeloid subsets, assess maturation/activation, and monitor expression of co-stimulatory, co-inhibitory and homing molecules.
- Participation in functional assays commonly used to test myeloid cell properties.
- Comparative analysis of the resulting mouse iPSC-derived myeloid cells with my own experience on human iPSC-derived myeloid cells.

Month 3: Mouse lung cancer model and knowledge transfer

- Getting acquainted with the genetic mouse models of non-small cell lung cancer and experimental setups used in dr Benvenuti lab to study cDC1–CD8 T-cell interactions and antitumor immunity.
- Participating, where feasible, in selected steps of these experiments (lung tissue processing; multi-colour flow cytometry analysis of myeloid and T-cell compartments).
- Discussing with the host team how iPSC-derived myeloid cells could be integrated into such models in the future (for example as a source of cDC1-like cells for therapeutic boosting of antitumor responses).

The planned stay in ICGEB laboratory will have several important outcomes:

- I will expand my current methodological portfolio by adding practical proficiency in mouse iPSC culture and differentiation. This will position me as a young researcher capable of working across human and mouse systems.
- Understanding how mouse iPSC-derived myeloid cells are generated and functionally assessed will help me better interpret preclinical data and design human studies that are conceptually aligned with in vivo models. This is essential for the long-term goal of developing cell-based immunotherapies that can move from bench to bedside.
- After returning to Serbia, I will be able to share the acquired protocols and insights with my colleagues, contribute to training of junior researchers, and assist in adapting certain mouse iPSC approaches to our infrastructure. This will strengthen our capacity to participate in future international collaborations in the field of iPSC-based immunology and immunotherapy.
- The exposure to a leading international laboratory working at the interface of stem cell biology and immunology will significantly contribute to my growth as an independent researcher. It will allow me to refine my scientific questions, improve my experimental design skills, and develop long-term collaborations that will be valuable beyond the scope of my PhD.

In conclusion, the three-month research visit to the Cellular Immunology Laboratory at ICGEB Trieste will provide focused, high-quality training in mouse iPSC technology and iPSC-derived myeloid cells. This experience will complement my ongoing work on human iPSC-derived myeloid cells, deepen my understanding of cross-species translational immunology, and contribute to strengthening the research potential of my home institution and of Serbian immunology.