

Workshop for Advancing Immunometabolism Research in Latin America and the Caribbean (ImMet-LAC)

SCOPE AND OBJECTIVES

The term *Immunometabolism* refers to a multidisciplinary field of study that merges classical immunology and metabolism, utilizing experimental approaches and frameworks from both domains. It serves as a burgeoning frontier in Immunology, enriching our understanding of the immune system by shedding light on how metabolism influences the effector functions of immune populations and its implications for the development of diseases.

The exploration of Immunometabolism offers novel perspectives for research in a wide range of areas, such as cardiovascular, neurological, infectious, autoimmune, reproductive, metabolic diseases, and cancer. These strategies open avenues for discovering new therapeutic agents by providing small molecules as candidates for the treatment of numerous disorders linked to the immune response.

The primary goal of this workshop is to stimulate Immunometabolism research within Latin America and the Caribbean by nurturing participants' expertise and core understanding. The workshop format will primarily focus on acquainting attendees with the available methodological tools and training them to effectively implement these tools in their own research endeavors.

DATES, VENUE AND FORMAT OF THE COURSE

Date: From October 31 to November 2.

Place: Facultad de Ciencias Exactas y Naturales. Universidad de Buenos Aires (UBA), from 9 a.m. to 6 p.m.

Total duration: 30 hours including a final assessment (maximum capacity: 30 individuals).

Address: Facultad de Ciencias Exactas y Naturales. Ciudad Universitaria. Pavilion 2. Int. Güiraldes 2160. 1428 Buenos Aires.

Format: In-person sessions.

Course Structure: Incorporating theoretical classes, methodological discussions, and interpretation of experimental findings. The closing session will allow participants to present and deliberate on their project ideas, integrating immunometabolism concepts.

Language: English.

PARTICIPANTS –REQUIREMENTS – REGISTRATION DETAILS

This workshop welcomes researchers from the biological and health sciences domains, graduates with relevant backgrounds, along with doctoral or master's students.

A basic understanding of Immunology and cellular biochemistry is beneficial, together with an enthusiastic approach to actively engage in and outline the objectives of a brief research plan.

Once the [registration form is completed](#), accepted students will receive an e-mail with the schedule and the necessary materials.

The standard course fee will be USD 60, with a discounted rate of USD 40 to ALACI members or participants from Low-and Middle-income countries. Notably, scholarships will be available to cover the registration costs.

ORGANIZERS

Claudia Pérez Leirós & Daiana M. Vota. Laboratorio de Inmunofarmacología. Instituto de Química Biológica Facultad de Ciencias Exactas y Naturales (IQUIBICEN). Universidad de Buenos Aires-CONICET.

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Cinthia Stempin & Pilar Aoki. Centro de Investigaciones en Biología Celular e Inmunología (CIBICI)-CONICET. Facultad de Ciencias Químicas. Universidad Nacional de Córdoba.

GUEST SPEAKERS

Naomi Taylor. Center for Cancer Research. National Cancer Institute. Bethesda, MD. USA.

David Russell. Cornell University College of Veterinary Medicine. Ithaca, NY. USA.

Rafael J. Argüello. Aix Marseille Univ, CNRS, INSERM, CIML, Centre d'Immunologie de Marseille-Luminy, Marseille, France.

COURSE TOPICS. SCHEDULE AND DISTRIBUTION OF ACTIVITIES

	Thu 31	Fri 1	Sat 2
09-11	Module 1 Introduction to Immunometabolism Metabolic pathways in immune cells Immunometabolism during the innate and adaptive immune response	Methodological discussions OMICs SCENITH™ Seahorse™	Module 3 Immunometabolism and Cancer
11-13			Project discussion
14-16	Module 2 Experimental approaches and techniques to study immunometabolism	Interpretation of experimental findings	Module 4 Immunometabolism and infection
16-18			Final exam

Theoretical Classes and Seminars:

Module 1: Introduction, basic principles of metabolism studies. Metabolic pathways and metabolites involved in cell-cell communication and in the mechanisms by which immune cells instruct a tissue in the organism to sustain energy demands and adapt to environmental stimuli. Metabolic reprogramming in immune cells under basal conditions or in the face of stimuli and its impact on cell fate for activation, proliferation, and differentiation of different subpopulations. Immune homeostasis and Immunometabolism. Immunometabolism at the cellular and tissue level. Immunometabolism mechanisms during the innate and adaptive response.

Module 2: Cell culture methodologies, relevance of culture media, use of enzyme inhibitors. Determination of metabolites in conditioned media by spectrophotometric methods. Cytometry and single-cell methodologies. SCENITH. Extracellular flow and oxygen consumption measurement assay with Seahorse™ methodology. RNAseq and Metabolomics. Directed and non-directed studies. Mitochondrial dynamics.

Metabolite transport assays (glucose, fatty acids, glutamine) in peripheral blood lymphocytes, monocytes, and neutrophils from healthy donors using fluorescent probes and cytometry. Determination of enzyme activity of metabolic pathways. Determination of lactate and ATP by spectrometry and fluorometry. Effect of metabolic inhibitors on immune cell function.

Module 3-4: Immunometabolism in diseases. Reprogramming of the metabolism of immune cells induced by environmental conditions (inflammation, cancer, others). Metabolic symbiosis and commensalism in inflammatory processes, infections and cancer. Advances on therapeutic applications of metabolites based on principles of Immunometabolism.

Methodological discussions and interpretation of experimental findings:

This component of the course will span one full day (Friday), where participants will delve into methodology and approaches for investigating cellular metabolism in immune cells and tissues.

Further discussions will encompass the utilization of SCENITH and Seahorse methodology in lymphocytes, monocytes, and neutrophils from peripheral blood of healthy donors. Analysis of cytometry and extracellular flow data. Determination of glycolytic and mitochondrial dependence for ATP production. Effect of inhibitors of metabolic pathways. Analysis and discussion of results. Metabolomics. Targeted and non-targeted approaches. Controls. Data validation and analysis. Identification of metabolites in cell-cell communication in the context of tissue immunometabolism in reproduction and neurological diseases and cancer.

BIBLIOGRAPHY

Classic university texts on Biochemistry and Immunology.

Articles and Reviews:

SCENITH: A Flow Cytometry-Based Method to Functionally Profile Energy Metabolism with Single-Cell Resolution. Argüello RJ et al. *Cell Metab.* 32:1063-1075.e7 (2020).

Redox regulation of the immune response. Morris, G; Gevezova, M; Sarafian, V; Maes, M. *Cellular & Molecular Immunology* volume 19, 1079–1101 (2022).

Microenvironmental influences on T cell immunity in cancer and inflammation. Heintzman, D.R.; Fisher, EL; Rathmell, J.C. *Cellular & Molecular Immunology* volume 19, 316–326 (2022).

Metabolic adaptations of tissue-resident immune cells. Caputa, G; Castoldi, A; Pearce, EJ. *Nature Immunology* volume 20, 793–801 (2019)

A guide to interrogating immunometabolism. Voss, K; Hong, H.S.; Bader, J.E.; Sugiura, A; Lyssiotis, CA; Rathmell, J.C. *Nature Review Immunology* volume 21, 637-652 (2021).