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THE POWER OF GLYCO-CHECKPOINTS: A SWEET FUTURE FOR IMMUNOTHERAPY?

Abstract: The responsibility for decoding the biological information embedded in the glycome—the complete repertoire of glycans in cells and tissues—rests with endogenous glycan-binding proteins, or lectins, whose expression is dynamically regulated in tumor and inflammatory microenvironments. To identify novel therapeutic targets in cancer and autoimmune diseases, our laboratory investigates the molecular interactions between glycosylated receptors and lectins in the regulation of immune and vascular programs. Over the past years, we have uncovered essential roles for galectin-1, a prototype member of the galectin family, in suppressing antitumor immunity and restraining autoimmune inflammation by differentially modulating the fate and function of effector and regulatory T cells and by promoting the generation of immunosuppressive myeloid cells. We further demonstrated that glycosylation-dependent, galectin-driven circuits contribute to mechanisms of resistance to immunotherapeutic and anti-angiogenic strategies. More recently, we revealed a role for galectin–glycan interactions in models of neurodegenerative, cardiovascular, and fibrotic diseases. Collectively, these findings position galectins as regulatory “glyco-checkpoints” that translate the sugar code into immune and vascular programs within tumor and inflammatory microenvironments, underscoring their therapeutic potential across a broad spectrum of pathological conditions.

About the speaker: Gabriel Rabinovich is Director of the Laboratory of Glycomedicine at the Institute of Biology and Experimental Medicine, Senior Investigator of the Argentine National Research Council (CONICET), and Plenary Professor at the Faculty of Exact and Natural Sciences, University of Buenos Aires. He is a member of the US National Academy of Sciences (NAS), the European Molecular Biology Organization (EMBO), The World Academy of Sciences (TWAS), the Argentine Academy of Exact and Natural Sciences (ANCEFN), and the National Academy of Sciences of Argentina (ANC). His work has been recognized with more than 200 awards, including the Hakomori Award from the International Glycoconjugate Organization, the Karl Meyer Award from the Society for Glycobiology (USA), the TWAS Prize in Medical Sciences and the Konex Diamond Prize (Argentina). He has published 345 articles, many in high-profile journals, filed 11 patents, and supervised 31 PhD students and 25 postdoctoral fellows. He serves as Associate Editor and Editorial Board member for several journals and has received financial support from leading international agencies, including the

Wellcome Trust, the US National Institutes of Health (NIH), the Lounsbery Foundation (USA), the Cancer Research Institute (USA), the Kenneth Rainin Foundation (USA), the Multiple Sclerosis Society (USA), the Mizutani Foundation for Glycosciences (Japan), and the Argentine Ministry of Science and Technology. His research has led to the identification of a novel paradigm centered on the regulation of glyco-checkpoints in immune and vascular programs. Most recently, he co-founded Galtec, a biotech spin-off dedicated to translating galectin-based discoveries into new therapies for cancer and autoimmune diseases.