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Victora studies the basic biology of how antibodies are generated in response to infection and immunization. This includes the evolutionary process of affinity maturation in germinal centers, which is essential to improve antibodies' powerful targeting capabilities, and the dynamics with which the diversity of antibody responses are pruned and focused on subsequent exposures.

When a pathogen invades the human body, the immune system responds by producing proteins called antibodies that are precisely targeted at the invader. These antibodies become part of the immunological memory that confers resistance to subsequent exposures to the same pathogen, and form the basis for vaccination.

Antibodies are tuned to efficiently recognize a specific invader through affinity maturation, in which a small region of the antibody undergoes random hypermutation, followed by the proliferation of mutants with high affinity to the pathogen. This process occurs in anatomical structures within lymphoid organs known as germinal centers (GCs), where B cells—the cells that produce antibodies—multiply and mutate. The Victora lab is currently investigating the mechanistic details of this process. His research could lead to more effective vaccines against pathogens such as influenza or HIV, and could help explain how affinity maturation can malfunction in diseases such as allergies.

In previous work, Victora developed techniques to label and observe cells within the lymph nodes of live mice, and was able to shed light on how B cells with high-affinity antibodies are selected and amplified. In addition to defining the types of B cells in GCs and their migration patterns, the research identified another major component of the immune system, helper T cells, as the regulators of this process, being responsible for comparing B cells bearing different mutations and selecting the best ones for subsequent proliferation.

To gain a deeper understanding of how high-affinity antibodies are generated and evolve during this complex process, the Victora lab is now exploring three complementary perspectives: those of molecules, cells, and whole organs. On the molecular scale, research is underway to identify the key genes involved in how B cells respond to help from T cells, and how this help allows the fittest B cells to proliferate to become the dominant population in the GC in which they were selected. At the cellular level, the lab is exploring how physical interactions between cells transmit the information required for affinity maturation and other immune processes. Finally, Victora and colleagues are investigating how the diversity of antibodies made in an entire B cell response is constrained by the evolutionary culling required for selection of the best binders.

By applying a broad scope in their work—from individual genes to the dynamics within the spleen and lymph nodes—the Victora lab hopes to gain insight into the critical evolutionary processes by which the immune system refines its response to an infection or vaccine.

EDUCATION

B.M. in piano, 1998
M.M. in piano, 2000
Mannes School of Music

M.Sci. in immunology, 2006
University of São Paulo

Ph.D. in immunology, 2011
New York University

POSITIONS

Whitehead Fellow, 2012–2016
Whitehead Institute for Biomedical Research

Assistant Professor, 2016–2022
Associate Professor, 2022–2024
Professor, 2024–
The Rockefeller University

Investigator, 2024–
Howard Hughes Medical Institute

AWARDS

NIH Director's Early Independence Award, 2012

SciLifeLab Prize for Young Scientists, 2013

Searle Scholar, 2017

MacArthur Fellow, 2017

NIH Director's Pioneer Award, 2018

Burroughs-Wellcome Investigator in the Pathogenesis of Infectious Disease, 2018

Pew-Stewart Scholar for Cancer Research, 2019

AAI-BD Biosciences Investigator Award, 2024

Pew Innovation Fund Investigator, 2024

SELECTED PUBLICATIONS

Schiepers, A. et al. Molecular fate-mapping of serum antibody responses to repeat immunization. *Nature* 615, 482–489 (2023).

Jacobsen, J. T. et al. Expression of Foxp3 by T follicular helper cells in end-stage germinal centers. *Science* 373, eabe5146 (2021).

Mesin, L. et al. Restricted clonality and limited germinal center reentry characterize memory B cell reactivation by boosting. *Cell* 180, 92–106 (2020).

Pasqual, G. et al. Monitoring T cell-dendritic cell interactions in vivo by intercellular enzymatic labelling. *Nature* 553, 496–500 (2018).

Tas, J.M. et al. Visualizing antibody affinity maturation in germinal centers. *Science* 351, 1048–1054 (2016).