THE GIS
SPEAKER SERIES



Genome Institute of Singapore
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Epigenetics of innate immune memory

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Host: Shyam PRABHAKAR

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2.00pm – 3.00pm

GIS L2 – Seminar Room
60 Biopolis Street, Genome, Singapore 138672

About The Speaker

Musa Mhlanga is Professor and Chair of Epigenomics and Single-Cell Biophysics at Radboud University Medical Center and the Radboud Institute for Molecular Life Sciences in Nijmegen, where he is a member of the Departments of Internal Medicine and Human Genetics. His laboratory studies how the epigenome and the three-dimensional architecture of the genome encode memory in cells, with particular emphasis on long non-coding RNAs as regulators of genome organisation and gene expression. Using the innate immune system as a model, his group studies how progenitor cells acquire and retain inflammatory and trained-immune states, integrating single-cell genomics, spatial transcriptomics, multi-omics and advanced imaging in translational models of disease. He received his Ph.D. from New York University School of Medicine and was a U.S. National Science Foundation postdoctoral fellow at the Institut Pasteur in Paris. He is a scientific founder of two biotechnology companies and serves on the board of the Human Cell Atlas, where he co-chairs the Equity Working Group.

About The Seminar

Innate immune cells lack antigen receptors and are comparatively short-lived, yet they retain a memory of prior exposure that persists for months. This memory is encoded in chromatin rather than through receptor rearrangement. Innate immune memory therefore constitutes a tractable experimental system in which the stimulus is defined, the time of onset is known, and the resulting transcriptional state can be assayed at later time points.

This seminar will present evidence that the mechanisms underlying this phenomenon are principally transcriptional and epigenetic rather than immunological. Long non-coding RNAs act in cis to direct epigenetic modifying complexes to specific promoters through pre-existing three-dimensional chromatin contacts, and regulate the timing and amplitude of gene induction rather than functioning as binary switches. The resulting histone modifications are coupled to cellular metabolism: lactate generated by glycolysis is deposited on histones, linking the metabolic state of the cell to its epigenetic record. Because this memory persists beyond the lifespan of the circulating monocyte, it is established in haematopoietic progenitors within the bone marrow.