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cancer biology phd program

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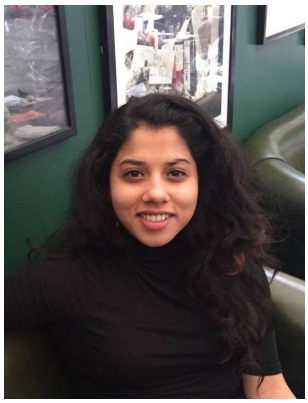

KEYWORDS – Haematopoiesis, Hematopoietic niche, 3D microscopy

MAIN FIELDS OF RESEARCH; ABSTRACT

Hematopoietic stem cells (HSCs) contribute to blood cell production throughout life and are found at rare, yet tightly regulated frequencies in adult bone marrow (BM). During embryonic and postnatal development, HSCs expand through continuous self-renewing proliferation. Upon entry into adulthood the vast majority of HSCs synchronously convert to a quiescent state. From then on, at any given moment very few HSCs are found in active stages of cell cycle, which suffices to compensate basal HSC loss due to differentiation or cell death. Since proliferation rates of individual HSCs are heterogeneous, entry and exit from cell cycle need to be coordinated at the level of the HSC pool. To date, the mechanisms that orchestrate this collective proliferative behaviour and effectively control the maintenance of homeostatic HSC numbers remain unknown.

Our aim is to investigate the broad spatial heterogeneity of HSCs that tend to cluster and accumulate in relatively large regions of the BM. We postulate that molecular crosstalk between proximal HSCs enables them to perceive their local densities and triggers collective regulation of HSC function to preserve homeostasis. We also aim to investigate the potential role of quorum-sensing mechanisms in HSC crosstalk and maintenance of HSC homeostasis.

SPECIAL TECHNIQUES AND EQUIPMENT

3D organ-wide microscopy, deep learning-based image analysis and spatial statistics.