



Cellular and Physiological Sciences Seminar Series

Stephanie Ellis, PhD

NYSCF Druckenmiller Postdoctoral Fellow
Laboratory of Mammalian Cell Biology & Development
The Rockefeller University

Thursday, September 5, 2019
12:45 - 1:45 (LSC 3)
Host: Dr. Guy Tanentzapf

"Survival of the Fittest: How Cell Competition Shapes the Emergence of Form and Function in Complex Epithelia"



Complex tissue morphology arises from coordinated activity of stem cells during development. However, the quality control mechanisms that might act in stem cells during growth to promote tissue fitness are not well understood. Cell competition has been proposed to act as a selection mechanism in rapidly expanding tissues, whereby less fit "loser" cells are eliminated by neighbouring "winner" cells. The extent to which cell competition acts as a conserved regulator of tissue and organ growth is unknown. To address this question, we establish a model to study cell competition in the stem cells of the developing skin. Using a unique multidisciplinary strategy, we show that growth is inherently heterogeneous, and shaped by cell competition dynamics, during rapid tissue expansion and remodelling. Less fit loser clones are actively eliminated over time to maximize the fitness of the skin to act as a barrier and repair wounds. Delving into mechanism, we uncover a surprising developmental transition in the mode by which loser cells are eliminated as the tissue morphology changes. Furthermore, we ascribe physiological relevance, as when cell competition is perturbed, so too is barrier formation. Altogether, our findings illuminate how the strategy a tissue uses to preserve fitness can evolve as architectural complexity increases during morphogenesis. Moreover, we hypothesize that having multiple strategies to eliminate less fit cells also confers robustness on tissue function. Finally, our data raises intriguing possibility that cell competition acts as a selective force during epidermal development to optimize tissue fitness for post-natal life.