

Title: Stem cell population dynamics, tissue homeostasis and regeneration

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Abstract: Despite the importance of regeneration and tissue homeostatic processes to human biology and health, relatively little is known about how these adult processes are controlled. Numerous issues remain unaddressed including: How organ systems maintain their form and function while in a state of cell flux; How animals control and coordinate the size and cell number of multiple organ systems; How developmental genes re-express in the adult during tissue homeostasis. Answering any of these issues would set a baseline from which to try to enhance regenerative properties in multicellular organisms, particularly after injury. We have chosen the freshwater planarian *Schmidtesa mediterranea* as a model system to address these fundamental biological problems. The speed and robustness of both tissue homeostasis and regeneration, as well as the abundance of pluripotent stem cells in *S. mediterranea*, provide unique opportunities to address cellular and molecular problems associated with transform these animals into an experimentally accessible system to gain mechanistic insight on these problems at molecular and cellular levels. Here we will discuss the role of the planarian stem cells in homeostasis and regeneration as well as some of the factors and behaviors displayed by this cells as they carry out their restorative functions.