Stem cells, with their defining characteristics—extensive proliferative potential and an ability to give rise to one or more specialized cell types—are common in early embryos. But by adulthood, only a few stem cells remain, tucked away in their own private niches. They have, nonetheless, retained a remarkable capability: They can operate at a “steady state” to maintain and repair tissues with no apparent limit throughout life.

In the *Drosophila* testis, the stem cell “ecosystem” Jones studies, the stem cells sit at the tip of the testis, cradled in their niche, which is also known as the apical hub. As a stem cell divides, one daughter cell moves out of the niche to generate mature sperm cells. The remaining daughter cell stays put and retains its stem cell identity. In an earlier study, Jones and her team had shown that the hub cells send out a local signal, which supports neighboring stem cells, making hub cells an essential component of the stem cell niche.

More recently, they explored how stem cells respond to body-wide circulating signals in addition to local signals emanating from the stem cell niche. The insulin/IGF pathway, which is best known for controlling blood glucose, serves as a “nutrient sensor” and plays an important role in aging in many organisms, including fruit flies. When the researchers fed their flies a “poor,” proteinless diet, the levels of circulating insulin-like peptides plummeted, and stem cell numbers started to decline. Upon re-feeding, insulin-like peptide expression and stem cell numbers recovered quickly. The study revealed that stem cells can sense changes in available nutrients and respond by maintaining only a small pool of active stem cells for tissue maintenance. When favorable conditions return, stem cell numbers multiply to accommodate increased demands on the tissue.

Elucidating the mechanisms by which the insulin/IGF pathway influences stem cell behavior under normal conditions and in response to stress has provided important insights into the use of stem cells in regenerative medicine, during wound repair, and in individuals experiencing metabolic stress.

For more information, please visit salk.edu/faculty/jones.html

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“The behavior of stem cells is regulated both by intrinsic factors within the stem cells and extrinsic factors from the surrounding environment, which is known as the stem cell niche. I am interested in how the relationship between stem cells and their environment changes during development, aging, and tumorigenesis.”