

Featured Publication Note

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Live imaging of single stem cells within their niche

Dr. Jean-René Huynh and colleagues have used *Drosophila* germline stem cells (GSCs) to examine some of the essential processes underlying the extraordinary properties of stem cells. GSCs divide asymmetrically generating one daughter cell which adopts the GSC fate, and one daughter cell which further differentiates into a cystoblast.

In this study, researchers showed that the *wicked* (*wcd*) gene is essential for the balance between GSC self-renewal and differentiation and encodes a functional component of the U3snRNP, required for pre-RNA maturation. The localization of Wcd during divisions of GSCs within their niche, *ex vivo*, was examined with live-cell imaging using **UltraVIEW** spinning disk (CSU10) technology. Single GSCs were maintained and imaged over long periods of time and this gave a better understanding of stem cell driven regeneration than using fixed tissues. The results showed an asymmetric segregation of Wcd particles upon mitosis in GSCs (see figure). They also showed that a fraction of Wcd segregates asymmetrically in dividing larval neural stem cells (NSCs). In both cases, Wcd segregates into the larger and/or self-renewing cell.

The requirement of Wcd in ventral nerve cord neuroblasts was also analyzed, using **Volocity** software for 3D reconstructions and measurements of wild type and *wcd* neuroblasts. Only objects above a background threshold were analyzed by the software. A noise-removing filter was applied and objects less than 50 μm^3 were excluded. The total volume of pixels within these objects was then measured, reflecting neuroblast size. On average, *wcd* neuroblasts were half the size of wild type neuroblasts, suggesting that Wcd is required for NSC proliferation and growth. The conclusion of the study was that regulation of ribosome synthesis is a crucial parameter for stem cell maintenance and function.

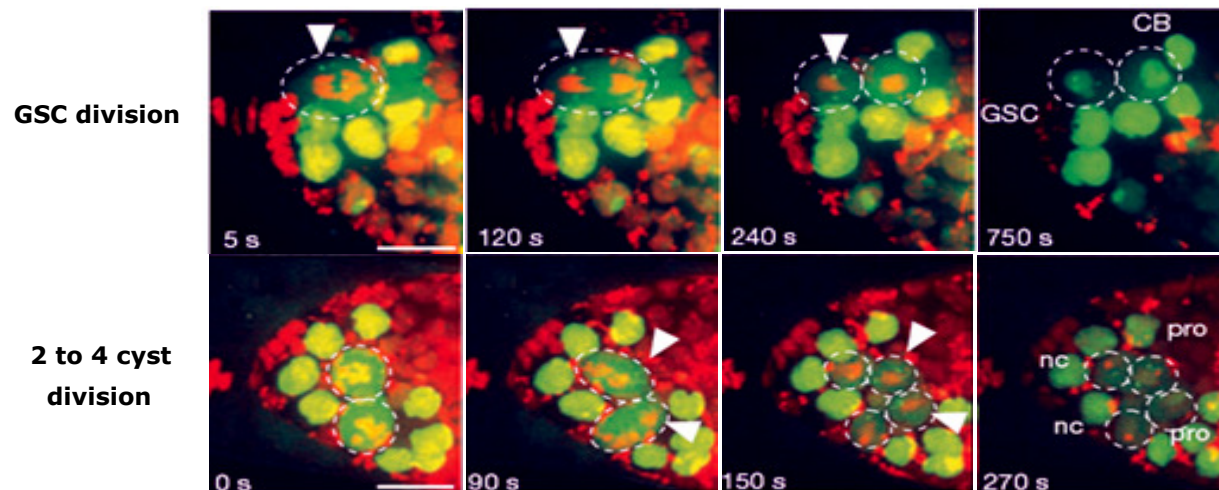


Figure: Wcd is asymmetrically segregated upon GSC mitosis

Top row: The dividing GSC is highlighted by a white dashed line. Soon after nuclear envelope breakdown, Wcd::GFP (green) forms a bright dot (arrowhead) that segregates into the new GSC. Once the two daughter cells have re-formed, the dot re-localizes to the nucleus. The DNA marker histoneH2B is shown in red.

Bottom row: Germline cyst division leads to the formation of a four-cell cyst. The dividing cyst is highlighted by a white dashed line. Soon after nuclear envelope breakdown, Wcd::GFP forms several bright dots that are preferentially segregated into the two procytes (pro, arrowheads) nc: nurse cells. Scale bar: 4 μm .