

Featured Publication Note

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Live cell 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 U3snoRNP, 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 Velocity[®] 3D Image Analysis software for 3D reconstructions and quantitative 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.

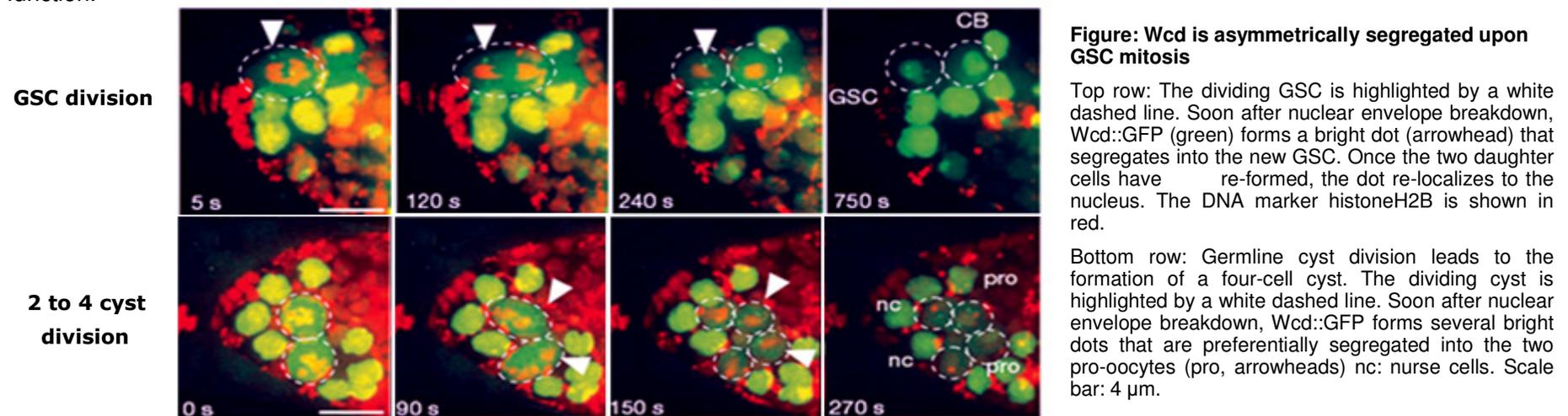


Figure adapted with permission from Macmillan Publishers Ltd: [Nature Cell Biology]. Fichelson P, Moch C, Ivanovitch K, Martin C, Sidor CM, Lepasant J-A, Bellaiche Y, Huynh J-R (2009). Live-imaging of single stem cells within their niche reveals that a U3snoRNP component segregates asymmetrically and is required for self-renewal in *Drosophila*.

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