A regulatory transcriptional loop controls proliferation and differentiation in Drosophila neural stem cells

ID 2581389
Author(s) Yasugi, Tetsuo; Fischer, Anja; Jiang, Yanrui; Reichert, Heinrich; Knoblich, Juergen A.
Author(s) at UniBasel Reichert, Heinrich ;
Year 2014
Title A regulatory transcriptional loop controls proliferation and differentiation in Drosophila neural stem cells
Journal PLoS ONE
Volume 9
Number 5

Neurogenesis is initiated by a set of basic Helix-Loop-Helix (bHLH) transcription factors that specify neural progenitors and allow them to generate neurons in multiple rounds of asymmetric cell division. The Drosophila Daughterless (Da) protein and its mammalian counterparts (E12/E47) act as heterodimerization factors for proneural genes and are therefore critically required for neurogenesis. Here, we demonstrate that Da can also be an inhibitor of the neural progenitor fate whose absence leads to stem cell overproliferation and tumor formation. We explain this paradox by demonstrating that Da induces the differentiation factor Prospero (Pros) whose asymmetric segregation is essential for differentiation in one of the two daughter cells. Da co-operates with the bHLH transcription factor Asense, whereas the other proneural genes are dispensible. After mitosis, Pros terminates Asense expression in one of the two daughter cells. In da mutants, pros is not expressed, leading to the formation of lethal transplantable brain tumors. Our results define a transcriptional feedback loop that regulates the balance between self-renewal and differentiation in Drosophila optic lobe neuroblasts. They indicate that initiation of a neural differentiation program in stem cells is essential to prevent tumorigenesis.

Publisher Public Library of Science
ISSN/ISBN 1932-6203
edoc-URL http://edoc.unibas.ch/dok/A6263197
Full Text on edoc Available;
Digital Object Identifier DOI 10.1371/journal.pone.0097034
PubMed ID http://www.ncbi.nlm.nih.gov/pubmed/24804774
ISI-Number WOS:000335728900132
Document type (ISI) Article