

Abstract

Understanding how stem cell fate is initiated, maintained, and terminated is important, as improper differentiation or maintenance of stem cells has been implicated in cancer and other degenerative diseases. The *Drosophila* germline is an excellent system to study stem cells because germ cells are both totipotent and immortal. During their life cycle, germ cells acquire a stem cell fate and become germline stem cells (GSCs), which both self-renew and differentiate to become gametes. Preliminary results from our lab show that the cell cycle is altered, especially Gap phase 2 (G2), between the GSC and its daughter, suggesting that cell cycle regulation may be an important mechanism to promote differentiation. To comprehensively identify mechanisms of cell cycle regulation in the GSC and its daughter, we are comparing their cell cycle programs using various loss of and gain of function approaches and cell cycle makers to analyze every stage of the cell cycle. Thus, we are working to discover whether cell cycle programs between the GSC and its daughter are completely asynchronous. Several cancers, including breast cancer, result from loss of cell cycle control. Our work here shows that these steps are intimately connected, indicating that cancers may result from loss of such developmental programs.