In the Drosophila germline stem cell ovary niche, two stem cells compete with each other for niche occupancy to maintain stem cell quality by ensuring that differentiated stem cells are rapidly pushed out the niche and replenished by normal ones. To gain a deep understanding of this biological phenomenon, we have derived a mathematical model for explaining the physical interactions between two stem cells. The model is a system of two nonlinear first order and one second order differential equations coupled with E-cadherins expression levels. The model can explain the dynamics of the competition process of two germline stem cells and may help reveal missing information obtained from experimental results. The model predicts several qualitative features in the competition process, which may help design rational experiments for a better understanding of the stem cell competition process.

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