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## Breaking the symmetry: understanding Centrosomin incorporation in Drosophila centrosomes in order to study asymmetric division of neural stem cells.

A size asymmetry between the centrosomes in certain Drosophila stem cells is important for proper asymmetric cell division. How this centrosome size asymmetry is controlled is a key question in stem cell biology. It has recently been shown that differential rates of Centrosomin (Cnn) incorporation into centrosomes may lead to centrosome size asymmetry in Drosophila neural stem cells. Cnn forms a gradient in pericentriolar matrix (PCM) and live imaging combined with fluorescence recovery after photobleaching (FRAP) analysis has revealed that Cnn molecules first incorporate into the centre of the PCM and then spreads outwards throughout the rest of the PCM. In this work we propose a mathematical model composed of a coupled system of nonlinear reaction-diffusion type equations to explain the observed Cnn behaviour. We hypothesise that Cnn binds to its receptors near the centre of the PCM and is converted into a 'heavy' form which diffuses slowly as compared to cytoplasmic Cnn. Diffusion of heavy Cnn then creates a gradient in the PCM. Steady state analysis shows that heavy Cnn forms an exponentially decreasing gradient at steady state, which matches well with the experimentally observed Cnn gradient. Numerical simulations of the model also predict the FRAP kinetics of Cnn. Once we understand the mechanism of Cnn incorporation, we may be able to predict how this mechanism could be exploited to create centrosome size asymmetry in Drosophila neural stem cells.