**Motor-clutch model for substrate stiffness sensing by living cells**

David J. Odde

1-Department of Biomedical Engineering, University of Minnesota, Minneapolis, MN 55455

Cells sense the mechanical stiffness of their environment to control cell shape, differentiation, survival, proliferation, and migration. How cells sense the Young’s modulus of an elastic environment to make these vital decisions is not clear. We recently showed that a simple “motor-clutch” model exhibits stiffness sensitivity (Chan and Odde, Science, 2008). In particular, the F-actin retrograde flow rate and traction force exhibit a biphasic response to substrate Young’s modulus, an effect that we confirmed using embryonic chick forebrain neurons. We now further explore the behavior of the motor-clutch model, and assess which model parameters control the stiffness at which sensing is optimal. Our exploration of parameter space reveals that no single parameter in the motor-clutch model can strongly control the set-point for optimal stiffness sensing. Rather, parameters need to be changed coordinately to effectively change the set-point. In particular, coordinate increases of both motor and clutch numbers effectively increases the set-point stiffness. Our recent experimental studies with glioma cells are consistent with predictions of the motor-clutch model. We speculate that the motor-clutch model may be useful for *in silico* identification of combination drug targets for brain cancers.

My module "Modeling cellular processes". There will be theoretical lectures, including diffusion, thermodynamics & kinetics, and forces. I will teach students basic Monte Carlo and differential equation modeling as well, with specific examples from cell biology.

What is the typical background of the students, so know at what level I should be working. Also, will have my own sub group, as in Woods Hole, or will I have the entire class for a time?

Dave