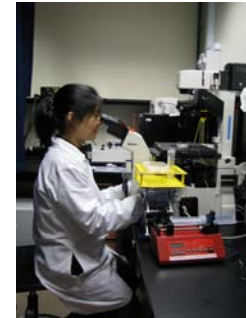




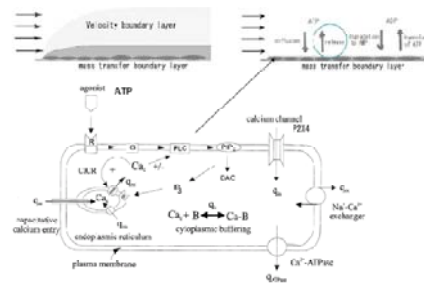
Microfluidics-based Systems Biology: Experimentation, Modeling and Control

Systems biology seeks to develop a complete understanding of cellular mechanisms by studying the functions of intra- and inter-cellular molecular interactions that trigger and coordinate cellular events. The progress in the development of **microfluidic devices** provides the opportunity to study cells effectively on both a single- and multi-cellular level with high-resolution and localized application of experimental conditions with biomimetic physiological conditions.



Mathematical modeling in **microfluidics-based systems biology** allows us not only to describe and explain the cellular events but also to predict new phenomena and get new findings in the cellular events. Meanwhile, once an appropriate mathematical model is constructed, the cellular events such as gene activity would be controlled with external signals by our intention, constituting a challenging but fantastic task in microfluidics-based systems biology!

In the early stage of this project, the **experimentation, modeling and control** in the intracellular calcium dynamics in human vascular endothelial cells cultured in a microfluidic device is being investigated. The successful accomplishment of this project will pave the way for quantitatively controlling the cellular events in **microfluidics-based systems biology**.



Selected publications:

1. C. Xiang, L. L. Cao, K. R. Qin, Z. Xu, B. M. Chen, "A modified dynamic model for shear stress induced ATP release from vascular endothelial cells," *Lecture Notes in Computer Science (LNCS)*, 2007, 4688: 462-472
2. K. R. Qin, C. Xiang, Z. Xu, L. L. Cao, S. S. Ge and Z. L. Jiang, "Dynamic modeling for shear stress induced ATP release from vascular endothelial cells," *Biomechanics and Modeling in Mechanobiology*, 2007(published online)
3. K. R. Qin, Z. Xu, H. Zhang, C. Xiang, S. S. Ge and Z. L. Jiang, "Dynamic modeling for modulation of ATP concentration at the endothelial surface by viscous shear flow," *Proceedings of the 2006 IEEE International Symposium on Intelligent Control*, 2006, 1270 – 1275

For further information, please contact:
Dr. Xiang Cheng
Tel: (65)6516 6210
Email: elexc@nus.edu.sg