Curriculum Vita

Name: Ke Bai

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EDUCATION

Ph.D.	Medical Engineering, 2012 Queen Mary, University of London, UK Thesis: Spatial distribution, temporal development and mechanical properties of the endothelial glycocalyx *in vitro*
M.S.	Pharmaceutics Science, 2007 Peking University, China
B.S.	Pharmaceutics Science, 2005 Peking University, China

PROFESSIONAL EMPLOYMENT:

09/2015- present	Postdoctoral scholar, National Institute of Allergy and infectious Diseases, National Institute of Health
10/2012 – 08/2015	Postdoctoral Scholar, Biomedical Engineering Department, Georgia Institute of Technology
09/2007 – 08/2008	Research Assistant, School of Biological Science and Medical Engineering, Beihang University, China

Grant & AWARDS:

2015 - 2018	Participant, “The study of entropy between cell membranes”, National Natural Science Foundation of China #11472285
2013 - 2014	Gandy-Diaz Teaching Fellowship, Georgia Institute of Technology
2011	Queen Mary, University of London Postgraduate Research Fund
2009 - 2012	School of Engineering and Material Science Research Studentship, Queen Mary, University of London
2008 - 2011	Overseas Research Studentship Award, Queen Mary, University of London
2007	Excellent Poster Award, 7th National Conference on Inorganic Chemistry
2006	Excellence in Academic Performance Scholarship, Peking University

PUBLICATIONS

Journals

R. J. Mallis*, **K. Bai*** (equivalent contributions), H. Arthanari, R. E. Hussey, M. Handley, Z. Li, L. Chingozha, J. S. Duke-Cohanc, H. Lu, J-H Wang, C. Zhu, G. Wagner, E. L. Reinherz. (**2015**) Pre-T cell receptor ligand binding impacts thymocyte development prior to αβTCR expression. *Proceedings of the National Academy of Sciences*, doi: 10.1073/pnas.1504971112

K. Bai, M. Marin, S. Jadhao, G. Melikian, C. Zhu (**2016**) In situ Kinetic Analysis of HIV Envelope Glycoprotein Interaction with Host Cells. (Under preparation)

W. -Z Liu, X.-C Wang, **K. Bai**, M Lin, G Sukhorukov, and W Wang (**2014**) Microcapsules functionalized with neuraminidase can enter vascular endothelial cells in vitro, *Journal of Royal Society-Interface*, doi:10.1098/rsif.2014.1027

K. Bai, W Wang. (**2013**) Shear stress-induced redistribution of the glycocalyx on endothelial cells in vitro. *Biomechanics and modeling in mechanobiology*, 13:303-311

K. Bai, W. Wang. (**2012**) Spatio-temporal development of the endothelial glycocalyx layer and its mechanical property in vitro, *Journal of Royal Society-Interface*, 9(74):2290-8.

K. Bai, Y. Huang, X. -L. Jia, Y. -B. Fan and W. Wang. (**2010**) Endothelium oriented differentiation of bone marrow mesenchymal stem cells under chemical and mechanical stimulations. *Journal of Biomechanics*, 43:1176-1181

Y. Huang, X. Jia, **K. Bai**, X. Gong, Y. Fan. (**2010**) Effect of fluid shear stress on cardiomyogenic differentiation of rat bone marrow mesenchymal stem cells. *Archives of medical research* 41 (7), 497-505

K Bai, T. -H Zhang, Z. -Y Yang, F Song and X. -D Yang (**2007**) Anisotropic, gradient & metal-like mechanical behaviour of teeth & their implication on tooth functions. *Chinese Science Bulletin*, 52(17): 2310-2315.

F. Song, K. -W. Xiao, **K. Bai** and Y. -L. Bai. (**2007**) Microstructure and nanomechanical properties of the wing membrane of a dragonfly. *Materials Science and Engineering A*, 457(1-2): 254-260.

Patent

K. Bai, L. Yuan, Q. Xia & X. -D. Yang. (**2007**) Lanthanon transferrin as the drug delivery carrier in blood brain barrier. Chinese Patent No: ZL200710064153.2

Conference Proceeding

K. Bai, M. Marin, S. Jadhao, G. Melikian, and C. Zhu, In situ Kinetic Analysis of HIV Envelope Glycoprotein Interaction with Host Cells. *Immunoreceptor- Federation of American Societies for Experimental Biology (FASEB) conference*. Steamboat Springs, Colorado. June 2014 (Presentation)

K. Bai, M. Marin, S. Jadhao, G. Melikian, and C. Zhu, "Single molecule analysis of the receptor binding kinetics and force regulated HIV entry to host cells", *Pediatric Healthcare Innovation: Advancing Technologies to Improve Child Health*. Atlanta. April, 2014

K. Bai, S. Jadhao, G. Melikian, and C. Zhu, "The Kinetics of 2D Binding of CD4 to HIV Envelope Glycoprotein gp120", *2013 Pediatric Research Retreat*. Atlanta, June 2013

K. Bai, W. Wang. "Spatial Distribution and Temporal Variation of the Endothelial Glycocalyx *in Vitro*", *Biomedical Engineering Society Annual Meeting 2011*. Hartford October 2011 (Presentation)

K. Bai, W. Wang. The endothelial glycocalyx: distribution and mechanical properties *in vitro*. *Bioengineering 11 conference*. London, UK. September 2011 (Presentation)

K. Bai, X.-D. Yang, K. Wang. "Lanthanon transferrin as the drug delivery carrier in blood brain barrier", *The 7th Conference on Biological Inorganic Chemistry of Chinese Chemical Society*. Hohhot, China. July 2007 (Presentation)

RESEARCH EXPERIENCE:

09/2015 to present	Cellular response and protection against Ebola virus infection
Achievements	Study the mechanism of vaccine induced immune protection via T cell response.
09/2013 to 08/2015	Pre-T cell receptor ligand binding impacts thymocyte development prior to αβTCR expression.
Achievements	Assess the role of the preTCR in thymic repertoire development using micropipette 2D-affinity measurement reveals that the binding of preTCR to

	pMHC is more promiscuous than αβTCR, where preTCR binds to both class I and II MHC; Force-regulated single bond lifetime of preTCR showed 10 times shorter maximal lifetime at optimal force than αβTCR, while force triggered Ca2+ flux are similar than that of the αβTCR.
10/2012 to 08/2015	In situ conformational change and kinetic analysis of HIV envelope glycoprotein (Env) en route to T cell membrane fusion.
Achievements	Delineate the HIV Envs bind to T cell CD4 receptor and CXCR4 coreceptor in a positive cooperate fashion, both micropipette 2D affinity and single bond lifetime measurement consistently suggest this observation; Demonstrate the difference of recombinant gp120 monomer (rgp120) versus virus like particle (VLP) trimolecular Env in binding kinetics and binding cooperativity, where rgp120 presented no cooperativity on CD4 and CXCR4 binding with significant lower affinity and quicker off-rate.
09/2008 to 09/2012	Haemodynamic effects of the endothelial glycocalyx as a mechanotransducer on vascular diseases and its mechanical properties.
Achievements	The spatial distribution and temporal development of human umbilical vain endothelial glycocalyx suggests that glycocalyx develop from the edge area to the apical area with time; The Young's modulus of endothelial glycocalyx was measured as 0.39kPa using AFM indentation; Under shear force, glycocalyx redistribute to the cell junction area along with the flow direction, after stopping the shear force, the fastest recovery appeared under 4 hours and gradually slow down from 8 hours, until its fully recovery in 24 hours.
09/2007 to 05/2008	Endothelium oriented differentiation of bone marrow mesenchymal stem cells under chemical and mechanical stimulations.
Achievements	The combination of VEGF and shear stress stimulation work more profound in determining MSC differentiation dynamics than any individual stimulation.
09/2005 to 05/2007	Lanthanon transferrin as the drug delivery carrier in blood brain barrier; The study of mechanical behaviors of human teeth using nano-indentation display metal-like characteristics rather than ceramics as considered traditionally

TEACHING EXPERIENCE:

2013 - 2014	Instructor Problems in Biomedical Engineering (BMED 1300) Georgia Institute of Technology, USA
2008 - 2011	Teaching assistant Tissue Engineering experiments, Department of Engineering, Queen Mary, University of London, UK
2006 - 2007	Teaching assistant Inorganic chemistry & cell biology experiments, School of Pharmaceutical Science, Peking University