

BIOGRAPHICAL SKETCH

NAME Li, Chenzhong (Last, First)		POSITION TITLE Associate Professor of Biomedical Engineering and Immunology	
eRA COMMONS USER NAME DABENNIU			
EDUCATION/TRAINING (<i>Begin with baccalaureate or other initial professional education, such as</i>)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
Hebei Polytechnic University, China	B.Eng.	06/90	Material Engineering
Kumamoto University, Japan	M.Sc.	04/97	Analytical Chemistry
Kumamoto University, Japan	Ph.D.	03/01	Bioengineering
University of British Columbia, Canada	Postdoctoral	12/02	Molecular Biology

A. Personal Statement.

The goal of the proposed research is to develop micro electrode array based immune biosensors capable of highly sensitive monitor multiplex Amyloid- β ($A\beta$) peptides both in CSF and at a single neuron surface. Originally trained in Bioengineering and Electrochemistry, my academic research over the last ten years has been in the interdisciplinary area of Biophysics, Nanotechnology and Neuron engineering with an emphasis on the development of miniaturized biomedical device such as biosensors. In my PhD training, I spent considerable time designing, fabricating and testing functional electrodes to study the electron transfer properties of redox protein and metal incorporated DNA molecules. As an independent principal investigator, since 2006, I have been collaborating with other biologists and made outstanding contributions in the development of miniaturized biosensors for cancer biomarkers and neurotransmitter analysis. Our earlier work on the chip based electrochemical biosensors has been supported by several government agencies including NIH and DoD to develop such a sensor for Point of Care Testings. Electrochemical biosensors are inexpensive, sensitive, chemically inert, and feature rapid responses thereby allowing for the *in vivo* and *in vitro* analysis of proteomic and genetic biomarkers. By coupling antibodies to the microelectrodes we have dramatically improved the sensitivity and specificity of the micro-immunosensors, which have been successfully used for the detection of the breast cancer biomarker Vascular Endothelial Growth Factor (VEGF), the oxidative DNA biomarker 8-OHdG and the Alzheimer's Disease (AD) associated Amyloid- β ($A\beta$) peptide both in solution and at a single cell's surface. The idea to use the micro immunosensors for the *in vitro* and *in vivo* detection of $A\beta$ in the setting of Alzheimer's disease was initiated in 2009. Since then, we have established research collaboration with the $A\beta$ Microdialysis Core Facility at Washington University Medical School and the Institute of Neuro-Immune Pharmacology at Florida International University to develop an $A\beta$ biosensor. In the preliminary study, we found strong evidence that the $A\beta$ are electrochemical measurable due to the contamination of the redox active tyrosine residue. This is an exciting finding because it suggests that $A\beta$ could be monitored by electrochemical biosensing approaches. In the past year, I have successfully used an immune carbon fiber electrode based sensing platform to measure $A\beta$ 42 with the detection limit of 10 pM within a buffer solution. This approach can be applied to real biological samples or cell cultures to understand the kinetics and metabolic mechanisms of $A\beta$ generation at the single cell level. In future, we plan to extend the work into an implantable, wireless controlled microsensors for real-time analysis of $A\beta$ analysis in tissues and in control nerve systems. Furthermore, we envision that the immuno-electrical biosensor platform will be an important step toward the development of other different types of micro immunosensors that can be made by changing the attached antibody groups of the electrodes, such as to detect other nerve cell damage biomarkers and Tao protein, etc.

B. Positions and Honors.

Positions and Employment

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| 1994-2001 | Research Assistant, Kumamoto University, Kumamoto, Japan |
| 2001-2002 | Postdoctoral Research Fellow, Department of Biochemistry and Molecular Biology, University of British Columbia, Canada |
| 2002-2004 | Research Associate, Department of Biochemistry University of Saskatchewan, Canada |

- 2004-2006 Research Officer, Nanobiotechnology/Biosensor Lab., Biotechnology Research Institute, Canada
National Research Council, Canada
- 2006-2012 Assistant Professor, Department of Biomedical Engineering, Florida International University,
Miami, FL
- 2012-present Associate Professor (with tenure), Department of Biomedical Engineering, Florida International
University.
- 2013-present Associate Professor, Department of Immunology, Florida International University

Awards and Other Professional Activities

- 2012 **Guest Editor**, Special Issue on Biosensors, Journal of Neuroscience and Neuroengineering
- 2012-present **Associate Editor**, Chemical Sensors (Simplex Academic Publishers)
- 2011-present **Associate Editor**: Biosensors Journal (Ashdin Publishing)
- 2010-present **Associate Editor**: Applied Biochemistry and Biotechnology (Springer)

Honors

- 2014 FIU Faculty Award for Excellence in Research and Creative Activities
- 2013 Japan Society for the Promotion of Science (JSPS) Visiting Professor Award
- 2009,2011 Kauffman Entrepreneurship Professor Award

Ad hoc reviewer:

- 2014 National Institutes of Health (NIH), Special Emphasis Panel/Scientific Review Group ZRG1 F05-R
study section, the Cell Biology, Developmental Biology, and Bioengineering, ad hoc proposal reviewer.
- 2014 the Alzheimer's and related Diseases Research Award Fund (ARDRAF), proposal reviewer
- 2014 National Institutes of Health (NIH), Special Emphasis Panel/Scientific Review Group 2014/05 ZRG1
BCMB-N (50) R, Director's Pioneer Awards, ad hoc proposal reviewer.
- 2013 Alzheimer's Society (UK), ad hoc proposal reviewer.
- 2013 NSF, Biosensing Program, ad hoc proposal reviewer.
- 2012 National Institutes of Health (NIH), IMST AREA Review, proposals reviewer and panelist.
- 2012 National Institutes of Health (NIH) Director's Pioneer Awards reviewer.
- 2007 NSF IGERT reviewer and panelist
- 2007 NIH NIEHS ZES reviewer and panelist
- 2007, 2009, 2011 NIH EBT study section *Ad hoc* reviewer and panelist

C. Selected peer-reviewed publications (Selected from 105 peer-reviewed publications)

Most relevant to the current application

1. P. Shah, X. Zhu, C. Chen, Y. Hu, C.-Z. Li, Lab-on-Chip device for single cell manipulation and analysis, *Biomedical Microdevices*, 2014, 16(1), 35-41.
2. S. Prabhulkar, R. Piatyszek, J. R. Cirrito, Z.-z. Wu, C.-Z. Li, Microbiosensor for Alzheimer's Disease Diagnostics: Detection of Amyloid Beta Biomarkers, *Journal of Neurochemistry*, 122, 374-381, 2012.
3. Z. Zhang, A. J. McGoron, E. T. Crumpler, C.-Z. Li, Co-culture based blood-brain barrier in vitro model, a tissue engineering approach using immortalized cell lines for drug transport study, *Applied Biochemistry and Biotechnology*, 2011, 163, 278-295.
4. S. Alwarappan, C.-Z. Li, Simultaneous Detection of Dopamine, Ascorbic Acid and Uric Acid at Electrochemically Activated Carbon Nanotube Biosensors, *Nanomedicine, Nanotechnology, Biology and Medicine*, 2010, 6, 52-57.
5. S. Prabhulkar, C.-Z. Li, Assessment of Oxidative DNA Damage and Repair at Single Cellular Level via Real-time Monitoring of 8-OHdG Biomarker, *Biosensors and Bioelectronics*, 2010, 26 (4), 1743-1749.

Additional recent publications of importance to the field (in chronological order)

1. Z.Z. Wu, Z.W. Wang, L.G.Zhang, Z.X. An, D.H. Zhong, Q. P. Huang, M.R. Luo, Y.J. Liao, L. Jin, C.-Z. Li, W. Kisalita, Responsiveness of voltage-gated calcium channels in SH-SY5Y human neuroblastoma cells on quasi-three-dimensional micropatterns formed with poly(l-lactic acid), *Int'l J of Nanomed.*, 8,93-107, 2013.
2. L. Meng , R. Chen , A. Jiang , L. Wang , P. Wang , C.-Z. Li , R. Bai , Y. Zhao , H. Autrup , C. Chen, Short Multiwall Carbon Nanotubes Promote Neuronal Differentiation of PC12 Cells via Up-Regulation of the Neurotrophin Signaling Pathway, *Small*, 9,1786-98, 2013.

3. C. Liu, S. Alwarappan, Y. Zhang, H. Badr, J. J. Zhu, C.-Z. Li, Live Cell Integrated SPR Biosensing Approach to Mimic the Regulation of Angiogenic Switch (VEGF-VEGFR) upon Anti-Cancer Drug Exposure, *Analytical Chemistry*, 2014, 86(15):7305-10.
4. S. Alwarappan, M. Das, S. Mohapatra, C.-Z. Li, Peripheral Neural Devices: State-of-the-Art, *Journal of Neuroscience and Neuroengineering*, 2, 517-531 (2013)
5. C. Liu, T. Lei, I. Kosuke, T. Matsue, N. Tao, C.Z. Li, Real-Time Monitoring Biomarker Expression of Carcinoma Cells by Surface Plasmon Resonance Biosensors, *Chem.Comm*, , 2012, 48(84), 10389-10391.
6. P. Shah, X. Zhu, C. Chen, Y. Hu, C.-Z. Li, Lab-on-Chip device for single cell manipulation and analysis, *Biomedical Microdevices*, DOI 10.1007/s10544-013-9803-7, 2013
7. E. Hondroulis, S. J. Melnick, X. Zhang, Z-Z. Wu, C.-Z Li, Electrical Field Manipulation of Cancer Cell Behavior Monitored by Whole Cell Biosensing Device, DOI 10.1007/s10544-013-9788-2, 2013.
8. D. Carvajal, R. Guduru, L. Lagos, Y. Katsenovich, C.-Z. Li, Assessment of the Resistance to Uranium (VI) Exposure by *Arthrobacter* sp. Isolated from Hanford Site Soil, *Geomicrobiology Journal*, 30, 120-130, 2013.
9. E. Hondroulis, C. Liu, C.-Z. Li, Whole Cell Based Electrical Impedance Sensing Approach for Rapid Nanotoxicity Assay, *Nanotechnology*, 2010, 31, 315103 (9 pgs).
10. C.-Z. Li, S. Alwarappan, W. Zhang, N. Scafa, X. Zhang, Metallo Protoporphyrin Functionalized Microelectrodes for Electrocatalytic Sensing of Nitric Oxide, *American Journal of Biomedical Science*, 2009, 1, 274 - 282.

D. Research Support.

Ongoing Research Support

NIH 1R01DA037838-01 (PI: M. Nair)

04/01/14-03/31/15

Role: Co-I, 10% Academic Year

Title: Multifunctional Nanocarrier to Reeducate HIV from Latently Infected CNS Cells.

The goal of the project is to use magneto-electric nanoparticles for targeted drug delivery to brain for eradication of HIV from CNS reservoir and to treat meth induced neuronal impairments.

NIH R15 ES021079-01

02/01/12-01/31/15

Role: PI, 50 % of summer

Title: "Biosensing Devices for Cytotoxic and Genotoxic Assessment of Nanomaterials"

The goal of the project is to develop whole cell based biosensing device for neuron toxicity assay upon nanomaterial exposure.

NSF 1334417 (PI, J He)

Role: Co-Principal Investigator

Title: Carbon Nanotube Based Nanofluidic Device for Biological Sensing

09/01/13-08/31/16

The goal of the project is to integrate carbon nanotube to a microfluidic device for single molecule and for single cell analysis.

Accomplished Project

DoD W81XWH-10-1-0732

09/01/10-08/31/13

Role: Co-PI, 30 % of summer

Source: Department of Defense

Title: "Mass Scale Biosensor Threat Diagnostic for In-Theater Defense Utilization"

The goal of the project is to develop paper based biosensor to monitor the toxin exposure induced biomarkers in urine samples.

FA9550-07-1-0344 (PI: Kinzy Jones)

03/31/08-04/01/10

Role: Co-PI 03/31/08-04/01/10

Source: Department of Defense

Title: Ultra tracing of heavy metal toxins using chip based electrochemical sensors

The goal of the project is to develop miniaturized sensor for monitoring the environmental heavy metal pollutions.

