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Education & Experience

2009 – present	Associate Professor, Professor, Jiangnan University
2010 – 2011	Visiting scholar, University of California, San Diego, USA
2004 – 2007	Ph.D., Nanjing University
1998 – 2002	M.E., Jiangnan University
1992 – 1996	B.Sc., Nanjing University

Research Fields

Prof. Nandi Zhou's research focuses on aptamer-based bioanalysis, fabrication of novel nano-biosensors, monitoring and control of harmful residues in food, and real-time analysis of metabolites in fermentation process, etc. His specific research areas are listed below.

(1) Screening and characterization of target-specific aptamers and their applications in the detection of harmful residues in food.

Detection of harmful residues, including antibiotics and pesticides, and food-borne pathogenic microorganisms is of great importance in food safety control and international

trade. As specific recognition and signal elements, aptamers show excellent characteristics in the fabrication of aptamer-based biosensors for harmful residues. In order to screen high-specific, high affinity and high-stable aptamers for different targets, optimized magnetic beads-based SELEX, graphene oxide-SELEX and capillary electrophoresis-SELEX were employed to select appropriate sequences from random ssDNA library. Then aptamer sequences were truncated and optimized through homologous alignment, consensus secondary structure analysis and 3-D molecular docking. As for a variety of antibiotics-specific aptamers were screened and applied in the fabrication of diverse aptasensors for detection of antibiotics residues in food products, such as honey, milk and milk powder. The detection limits of the biosensors reached nM level over μM level of that of HPLC. Aptamers have also been applied in the development of rapid testing kit such as strip biosensors for harmful residues.

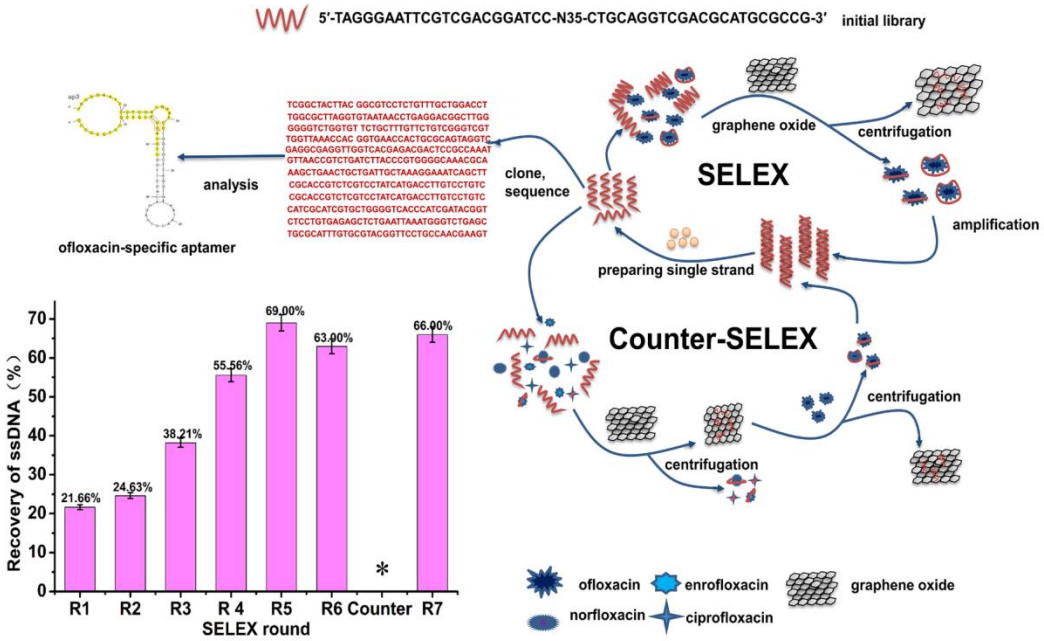

Fig. 1. Screening of ofloxacin-specific aptamer through GO-SELEX.

(2) Fabrication of nano-biosensors for target DNAs, specific enzymatic activities, and proteins.

Assays for sequence-specific DNAs, low-abundant proteins and specific enzymatic activities are key roles in the fields of food and fermentation industry, medical diagnosis and biology. Through introducing G-quadruplex, gold nanoparticles, magnetic nanoparticles and other functionalized materials, diverse signaling and amplification techniques were fabricated for high-sensitive detection of target molecules based on electrochemical, spectroscopic, fluorescent and PCR methods. The interaction between proteins and DNA can also be characterized.

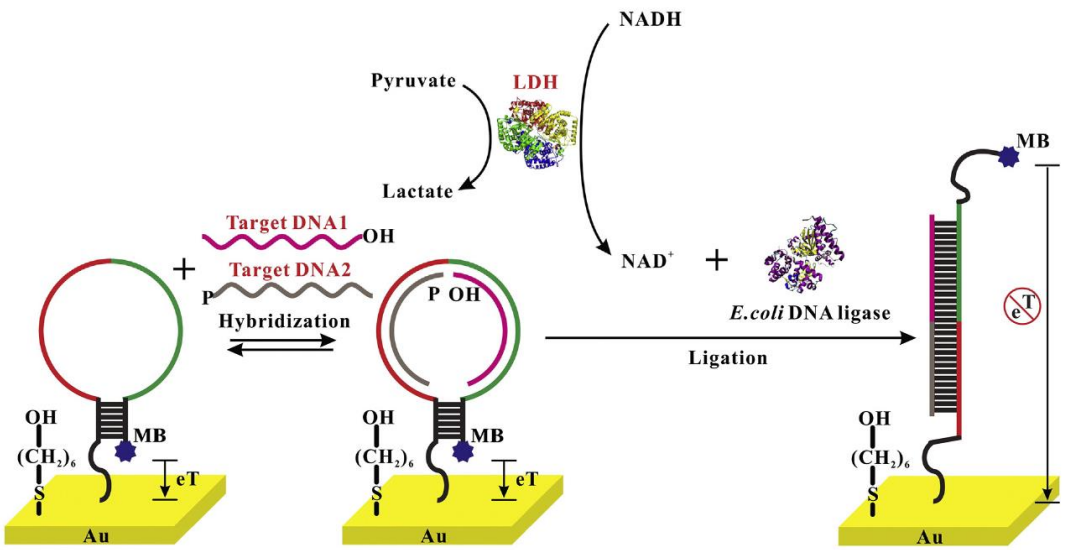

Fig. 2. Simultaneous detection of dual-target DNA and LDH.

(3) Detection of key biomarkers for diagnosis applications using logic-gate.

Key biomarkers are usually closely related with the development of diseases and damage. Due to the relatively low specificity of biomarkers, the accuracy of diagnosis can be greatly improved through the appropriate selection of 2-3 related biomarkers and fabrication of logic gate for bioanalysis. Mini-invasive electrochemical biosensors for transdermal detection were fabricated based on microneedle arrays. Meanwhile, fast diagnosis can be achieved through combined application of screen-printed electrodes, dry-reagent technique and enzyme-logic design. At present, we are working on the early screening of cancer through high-sensitive and simultaneous detection of tumor biomarkers.

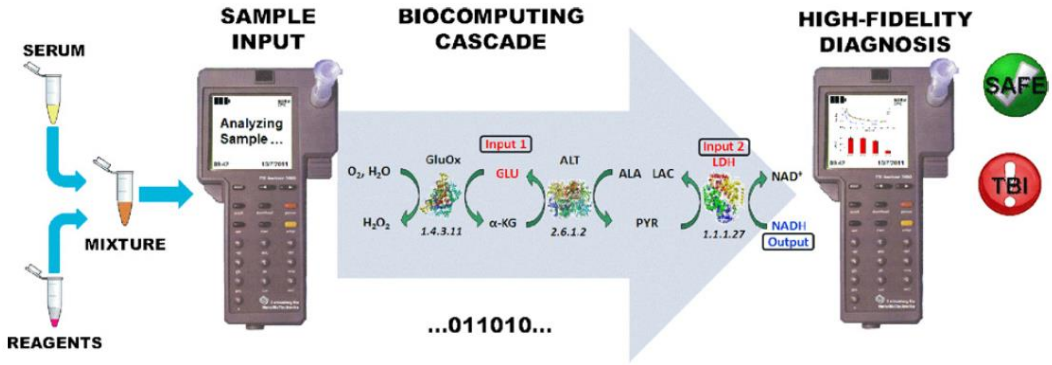

Fig. 3. Biocomputing concept illustrating diagnosis of traumatic brain injury.

(4) Real-time monitoring of metabolites during the fermentation process.

Real-time monitoring of metabolites during the fermentation process plays important role in fermentation control. As a complicated system, fermentation process is non-linear,

time-varying, irreversible and with big lag time. lacking of biosensors for biochemical parameters and modeling for complicated system lead to large difficulty in the control and optimization of fermentation process. A series of high-sensitive detection methods and biosensors were developed and used to fabricate real-time detection devices through the combination of microfluidic technique. Meanwhile, some enzymes have wide application in detection, such as urease and urethanase, were thoroughly investigated, including structural and functional analysis, dynamic characterization, fermentation and purification.

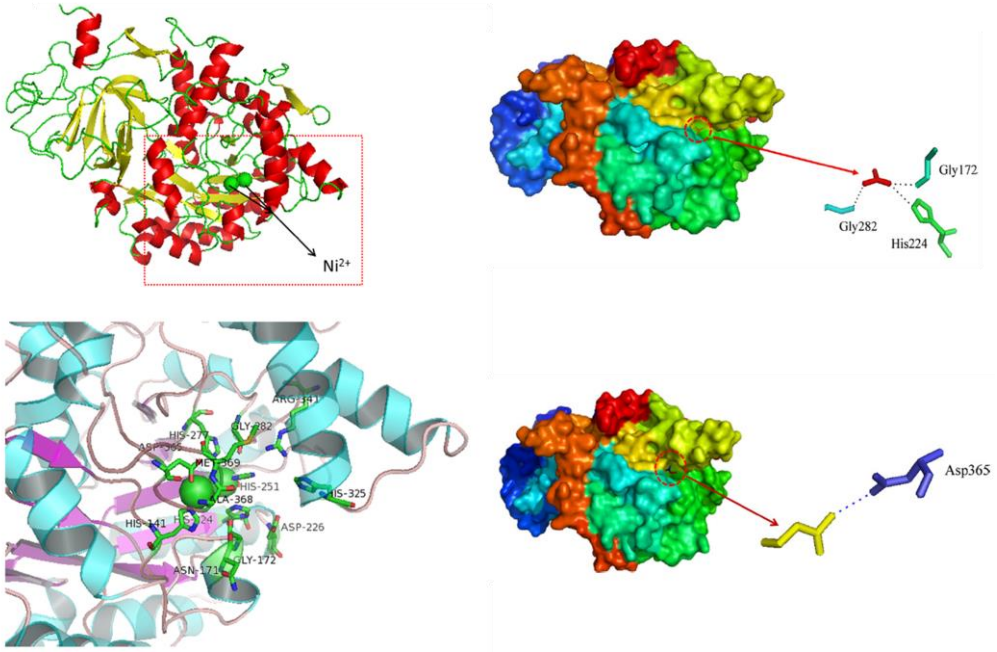

Fig. 4. Structural analysis of urethanase.

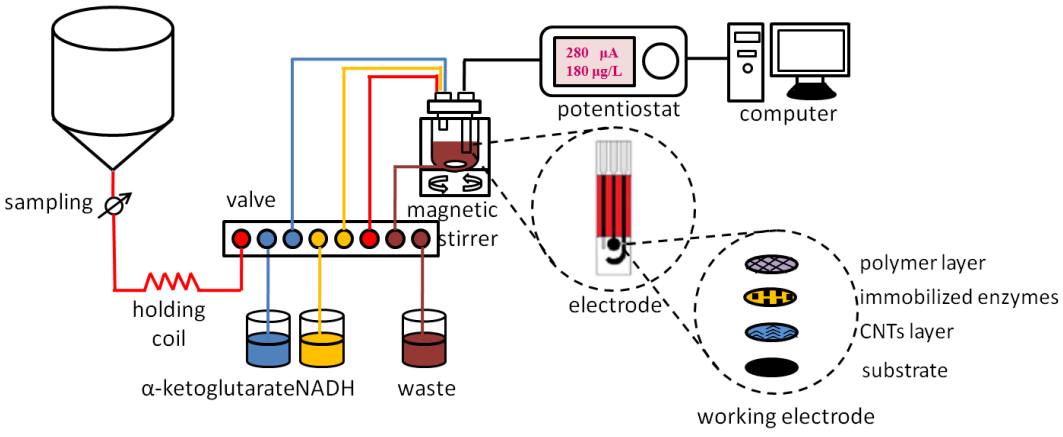

Fig. 5. On-line monitoring of ethyl carbamate in wine production.

Selected Publications

1. Xiaofan Sun, Shuling Wang, Yiping Zhang, Yaping Tian, **Nandi Zhou***, Ultrasensitive detection of DNA based on target-triggered hairpinassembly and exonuclease-assisted recycling amplification. **Sensors and Actuators B: Chemical** 2017, 252: 306-312.
2. Zhiwei Zhang, Xiaoxia Lu, Yaping Tian, **Nandi Zhou***, High-sensitive electrochemical determination of ethyl carbamate using urethanase and glutamate dehydrogenase modified electrode. **Electroanalysis** 2017, 29: 481-488.
3. Chunshuai Wang, Jing Liu, Xuyan Han, Chang Liu, Yaping Tian, **Nandi Zhou***, UV-visible spectroscopic detection of kanamycin based on target-induced growth of gold nanoparticles. **Analytical Methods** 2017, 9: 4843-4850.
4. Chunshuai Wang, Chang Liu, Jibao Luo, Yaping Tian, **Nandi Zhou***, Direct electrochemical detection of kanamycin based on peroxidase-like activity of gold nanoparticles. **Analytica Chimica Acta** 2016, 936: 75-82.
5. Yuhong Zhang, Yuanding You, Ziwei Xia, Xuyan Han, Yaping Tian, **Nandi Zhou***, Graphene oxide-based selection and identification of ofloxacin-specific single-stranded DNA aptamers. **RSC Advances** 2016, 6: 99540-99545.
6. Jingke Xue, Jing Liu, Chunshuai Wang, Yaping Tian, **Nandi Zhou***, Simultaneous electrochemical detection of multiple antibiotic residues in milk based on aptamers and quantum dots. **Analytical Methods** 2016, 8: 1981-1988.
7. Shuling Wang, Yong Liu, Xiaofan Sun, Yaping Tian, **Nandi Zhou***, Ultrasensitive electrochemical detection of dual DNA targets based on G-quadruplex-mediated amplification. **RSC Advances** 2015, 5: 57532-57537.
8. **Nandi Zhou***, Jibao Luo, Juan Zhang, Yuanding You, Yaping Tian, A label-free electrochemical aptasensor for the detection of kanamycin in milk. **Analytical Methods** 2015, 7: 1991-1996.
9. **Nandi Zhou***, Yong Liu, Yuanding You, Jibao Luo, Yaping Tian, Coupling DNA with enzyme activity: A complex electrochemical sensor with enhanced specificity. **Electrochemistry Communications** 2014, 42: 60-63.
10. **Nandi Zhou***, Juan Zhang, Yaping Tian, Aptamer-based spectrophotometric detection of kanamycin in milk. **Analytical Methods** 2014, 6: 1569-1574.
11. **Nandi Zhou**, Xiaolei Gu, Xiaohong Zha, Yaping Tian*, Purification and characterization of a urethanase from *Penicillium variabile*. **Applied Biochemistry and Biotechnology** 2014, 172: 351-360.
12. **Nandi Zhou***, Jingyuan Wang, Juan Zhang, Can Li, Yaping Tian, Joseph Wang, Selection and identification of streptomycin-specific single-stranded DNA aptamers and the application in the detection of streptomycin in honey. **Talanta** 2013, 108: 109-116.
13. **Nandi Zhou**, Xiaolei Gu, Yaping Tian*, Isolation and characterization of

urethanase from *Penicillium variabile* and its application to reduce ethyl carbamate contamination in Chinese rice wine. **Applied Biochemistry and Biotechnology** 2013, 170: 718-728.

14. Zonghuang Ye, Wei Zhang, Lili Liu, Guifang Chen*****, Zhongming Shen, **Nandi Zhou***, Fabrication of a colorimetric biosensing platform for the detection of protein–DNA interaction. **Biosensors and Bioelectronics** 2013, 46: 108-112.

15. Sa Li, Langyong Mao, Yaping Tian, Joseph Wang, **Nandi Zhou***, Spectrophotometric detection of tyrosinase activity based on boronic acid-functionalized gold nanoparticles. **Analyst** 2012, 137: 823-825.

16. Ming Zhou, **Nandi Zhou**, Filiz Kuralay, Joshua R. Windmiller, Serguey Parkhomovsky, Gabriela Valdés-Ramírez, Evgeny Katz, Joseph Wang*, A self-powered “sense-act-treat” system that is based on a biofuel cell and controlled by Boolean logic. **Angewandte Chemie International Edition** 2012, 51: 2686-2689.

17. **Nandi Zhou**, Joshua R. Windmiller, Gabriela Valdés-Ramírez, Ming Zhou, Jan Halámek, Evgeny Katz, Joseph Wang*, Enzyme-based NAND gate for rapid electrochemical screening of traumatic brain injury in serum. **Analytica Chimica Acta** 2011, 703: 94-100.

18. **Nandi Zhou**, Ya Cao, Genxi Li*, Electron transfer and interfacial behavior of redox proteins. **Science China Chemistry** 2010, 53: 720-736.

19. Lin Chen, Junyi Huang, Fanben Meng, **Nandi Zhou***, Distinguishing tumor cells via analyzing intracellular telomerase activity. **Analytical Sciences** 2010, 26: 535-538.

20. Kun Han, Zhiqiang Liang, **Nandi Zhou***, Design strategies for aptamer-based biosensors. **Sensors** 2010, 10: 4541-4557.

21. **Nandi Zhou**, Zhenyu Chen, Dongmei Zhang, Genxi Li*, Electrochemical assay of human islet amyloid polypeptide and its aggregation. **Sensors** 2008, 8(9): 5987-5995.

22. **Nandi Zhou**, Jing Wang, Ting Chen, Zhiguo Yu, Genxi Li*, Enlargement of gold nanoparticles on the surface of a self-assembled monolayer modified electrode: A mode in biosensor design. **Analytical Chemistry** 2006, 78: 5227-5230.