

International Pork Safety Forum
Improving Food Safety of Pork Supply Chain in China

猪肉供应链中致病菌快速检测技术研究
Rapid Detection of Pathogenic Bacteria in
Pork Supply Chains

林建涵

Jianhan Lin

中国农业大学

China Agricultural University

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PART 1



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研究背景 BACKGROUND



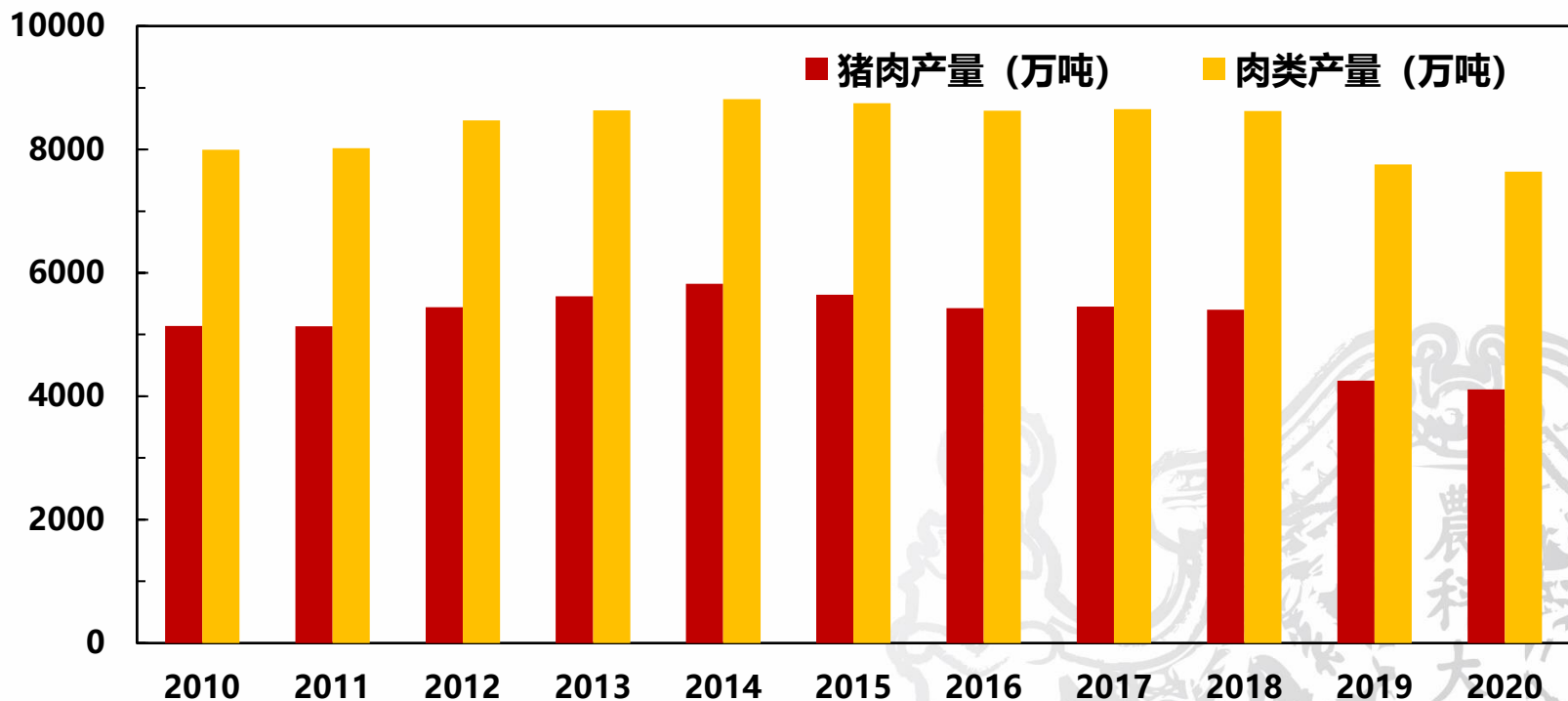
猪肉产量 Pork Production



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- 中国是世界第一大猪肉生产国和消费国，2020年全国肉类总产量7639万吨，其中猪肉产量4113万吨，占53.8%。

China is the largest producer and consumer of pork in the world. In 2020, the output of meats is 76.39 million tons and the output of pork is 41.13 million tons.



数据来源：国家统计局

猪肉供应链 Pork Supply Chain



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养殖
Farm



屠宰
Slaughter



加工
Process



运输
Transport



仓储
Store



零售
Retail

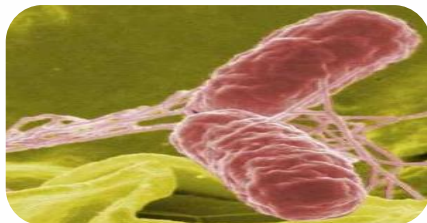
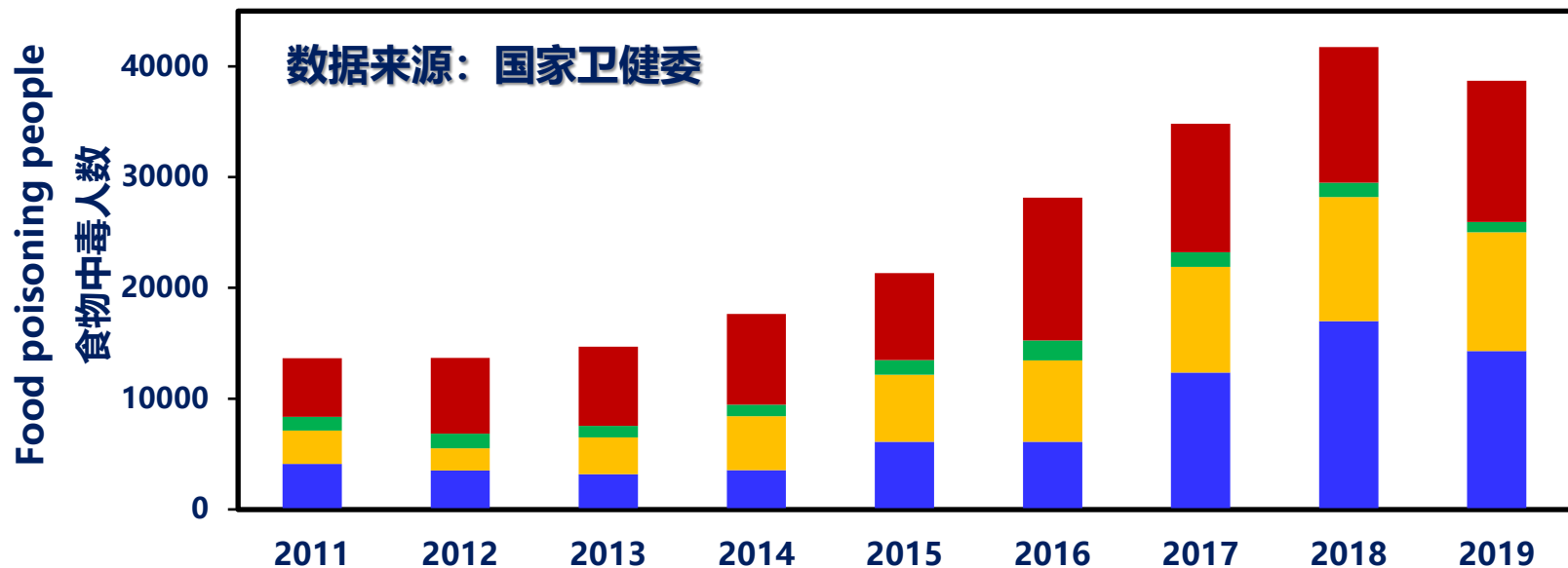
食品安全 Food Safety



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■ 病原微生物是食品安全重要风险因子，每年造成超万人食物中毒。

Pathogens are main risk factor for food safety, causing thousands of poisoning cases.



沙门氏菌
Salmonella



大肠杆菌 O157:H7
E. coli O157:H7



猪链球菌
Streptococcus suis

细菌检测方法 Bacterial Detection

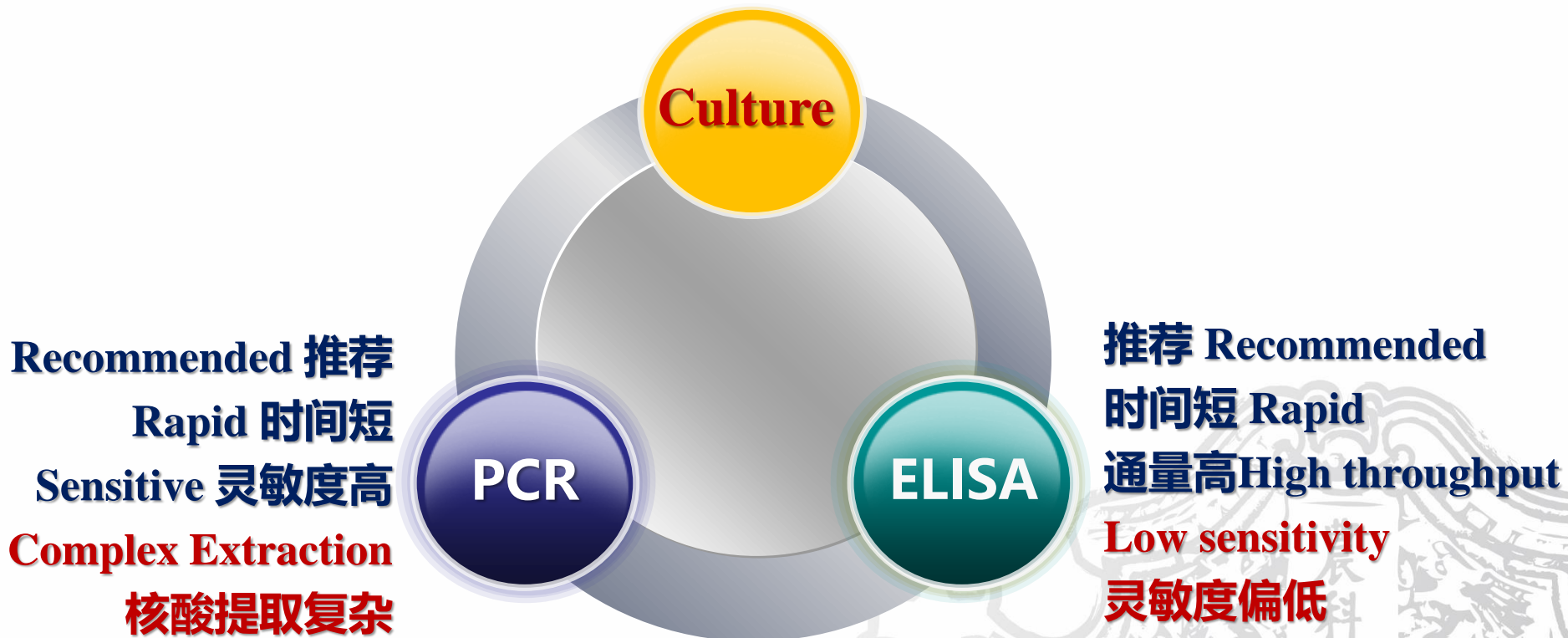


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金标准方法 Gold standard

灵敏、准确 Sensitive and accurate

操作复杂、时间长 Complex and time-consuming



面临的挑战 Challenges



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食品样本背景复杂
Complex background

农业利润空间小
Small profit margin

Big noise

干扰大



要便宜

Inexpensive

Weak signal

信号弱

要简单

Simple

筛查时病原浓度低
Low concentration

基层人员设施有限
Limited skill & facility

PART 2

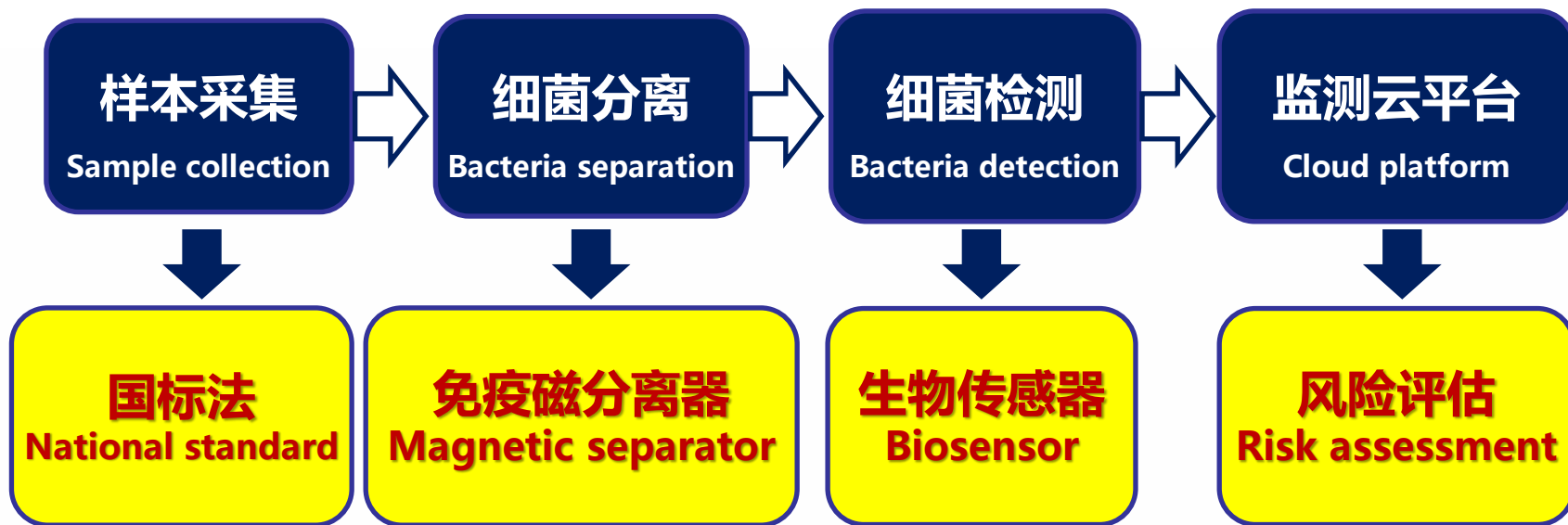


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近期研究工作 RECENT WORKS



整体方案 Systematic Solution



Sample information
样本信息



Control signal 控制信号



Detection signal 检测信号

检测结果
Detection Result

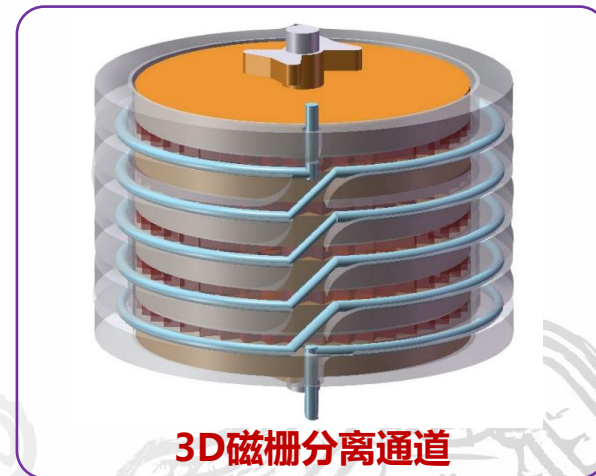
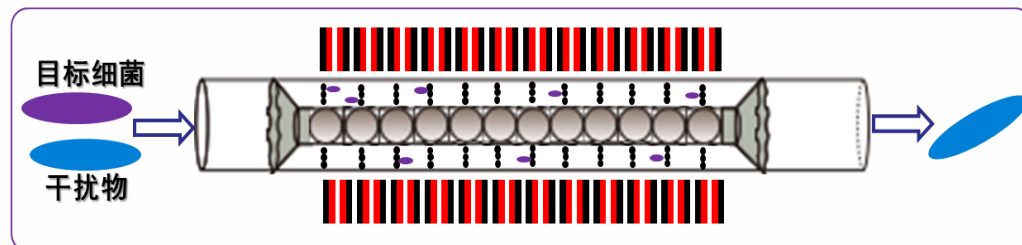
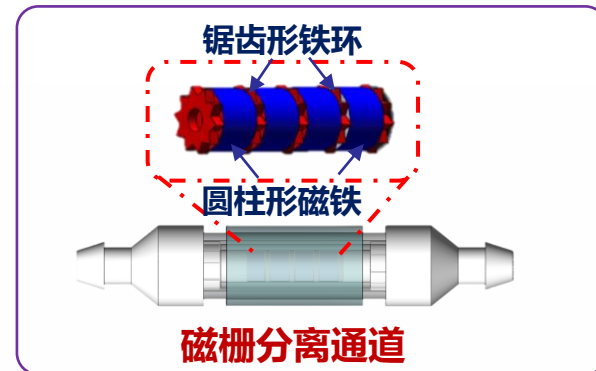
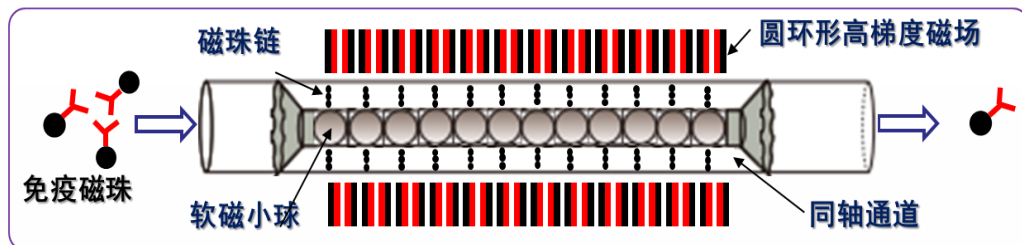


评估结果
Assessment Result

免疫磁分离器 Magnetic Separators



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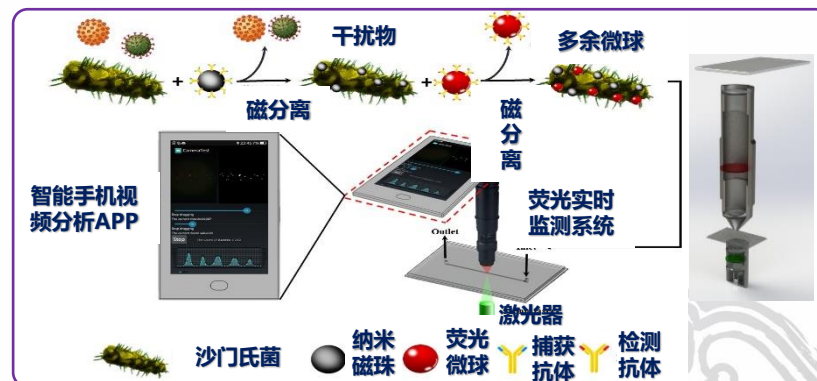
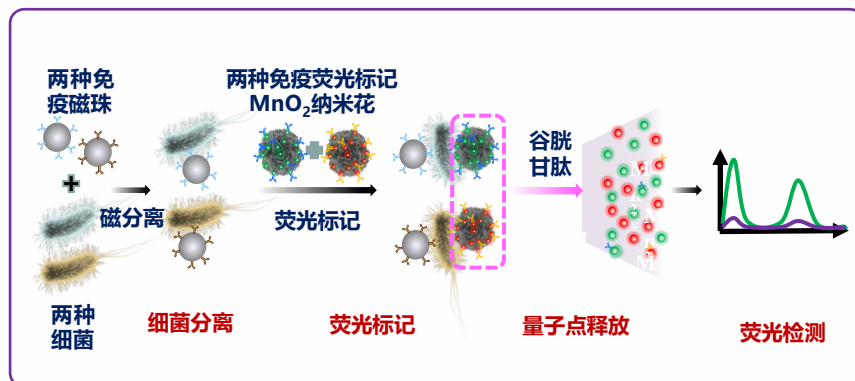
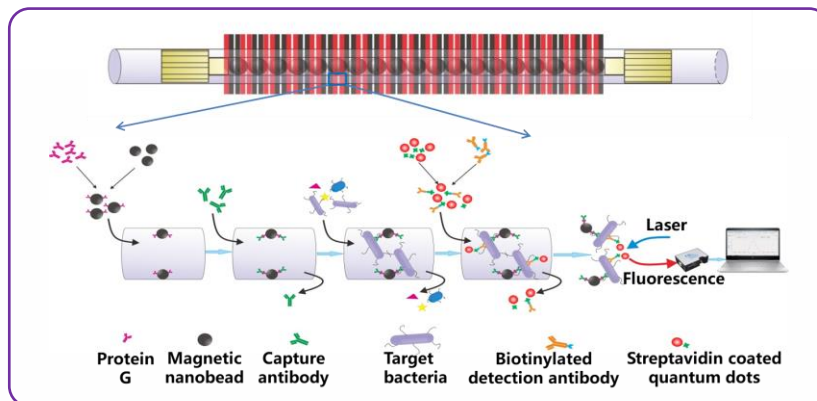
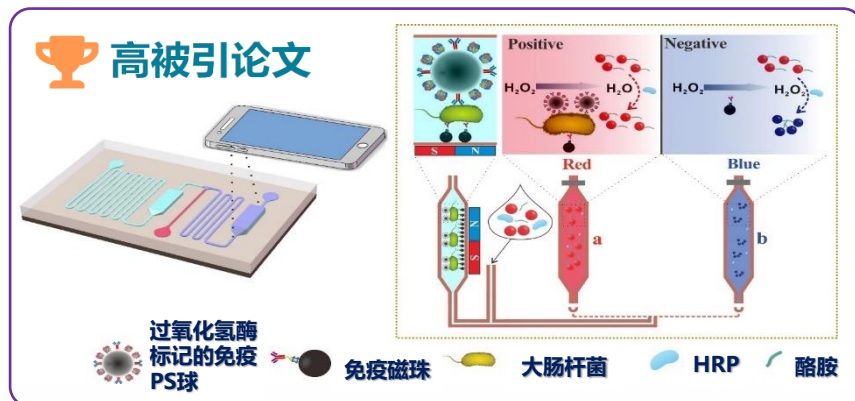
① Yuhe Wang, Journal of Separation Science, 2017;
② Gaozhe Cai, Micromachines, 2018;
③ Li Xue, Sensors and Actuators B: Chemical, 2018;
④ Lan Yao, Sensors and Actuators B: Chemical, 2018;
⑤ Fengchun Huang, Biosensors and Bioelectronics, 2018;

⑥ Xiaoting Huo, Micromachines, 2019;
⑦ Lei Wang, Biosensors and Bioelectronics, 2020;
⑧ Yu Hou, Biosensors and Bioelectronics, 2020;
⑨ Li Xue, Food Chemistry, 2020;
⑩ Ruya Guo, Microchimica Acta, 2020.

光学生物传感器 Optical Biosensors



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① Li Xue, Sensors and Actuators B: Chemical, 2018;

② Qi Chen, Sensors and Actuators B: Chemical, 2018;

③ Fengchun Huang, Theranostics, 2018;

④ Lingyan Zheng, Biosensors and Bioelectronics, 2019;

⑤ Huilin Zhang, Biosensors and Bioelectronics, 2019;

⑥ Ruya Guo, Sensors and Actuators B: Chemical, 2019;

⑦ Siyuan Wang, Biosensors and Bioelectronics, 2019;

⑧ Lei Wang, Biosensors and Bioelectronics, 2020;

⑨ Lingyan Zheng, ACS Sensors, 2020;

⑩ Li Xue, Food Chemistry, 2020.

监测预警云平台 Cloud Platform



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Integrated system of *Salmonella* monitoring and risk early warning for white broiler supply chain



白羽肉鸡沙门氏菌污染监测数据 *Salmonella* monitoring in white broiler

监测时间 Sampling time	监测环节 Sampling source	监测量 Sampling number	阳性数 Positive number

白羽肉鸡沙门氏菌风险分级 Risk rank of *Salmonella* in white broiler

风险值 Risk estimation	风险分级 Risk ranking



PART 3

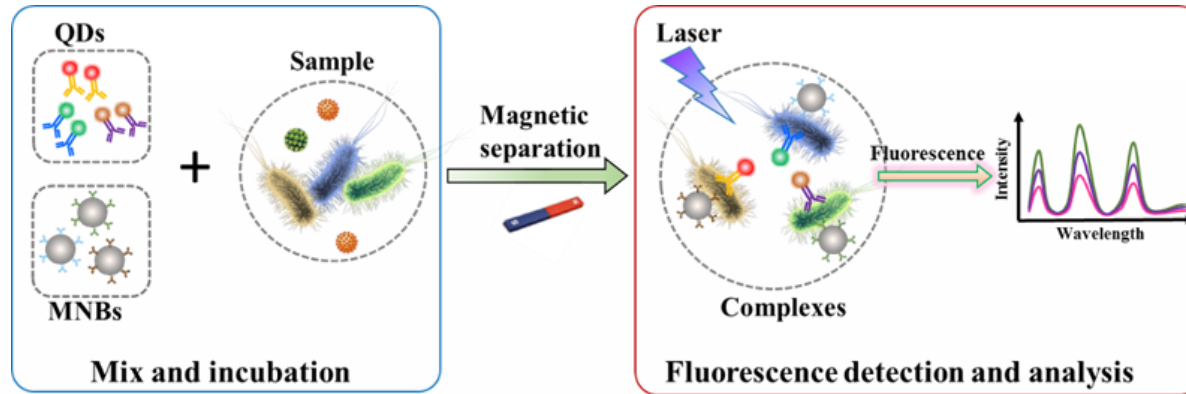


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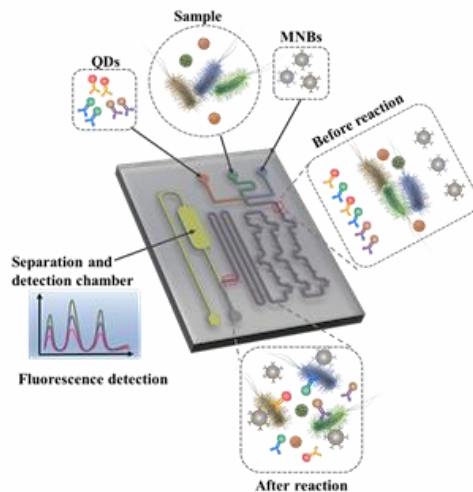
正在开展研究工作
ONGOING WORK



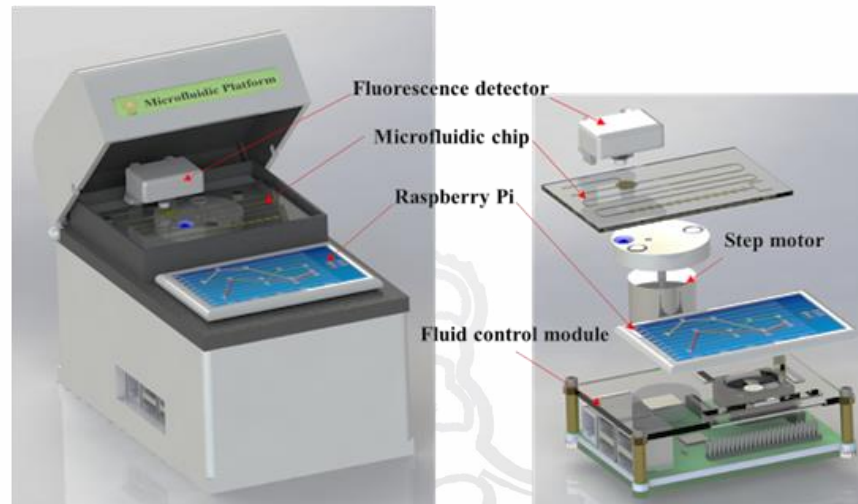
集成化生物传感器 Integrated Biosensor



Principle of this biosensor with QDs and MNBs
基于免疫量子点和纳米磁珠的生物传感器的工作原理



Microfluidic chip
微流控芯片



Biosensor research prototype
生物传感器研究样机



结论 CONCLUSIONS



总结 Conclusions



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□ 微流控芯片: **操作**

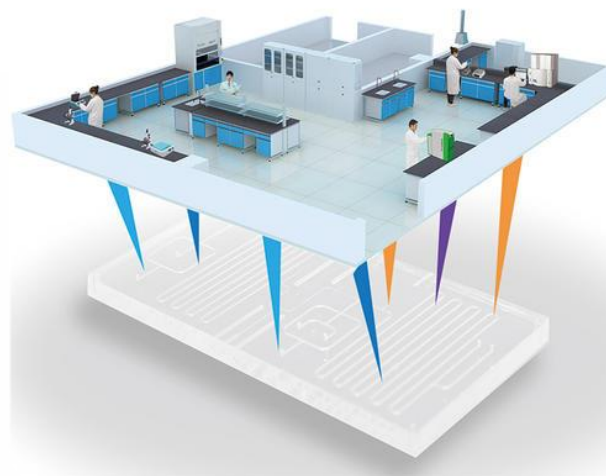
Microfluidic Chip

□ 智能手机: **仪器**

Smartphone

□ 物联网: **应用**

Internet of Things



致谢 Acknowledgements



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Walmart 

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THANKS FOR ATTENTION!



食品更安全 SAFER FOOD,
HEALTHIER ANIMAL 动物更健康!



创新

协同

交叉

-LIN'S LAB @ CAU -
BIOSENSOR