人工抗體篩選及其生醫應用

Screening of artificial antibodies and their biomedical applications

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We have developed several microfluidic systems for a variety of biomedical applications, including (a) fast diagnosis of influenza A, (b) automatic AST for antibiotics, (c) cardiovascular biomarkers and (d) artificial antibodies (aptamers) for bacterial detection. The following is the abstract of these published works.

(a) fast diagnosis of influenza A [1]

In this study, a smartphone-controlled, automated, and portable system was developed for rapid molecular diagnosis of pathogens (including viruses and bacteria) via the use of a colorimetric loop-mediated isothermal amplification (LAMP) approach on a passive, self-driven microfluidic device.

(b) automatic AST for antibiotics [2]

An integrated microfluidic system capable of automating AST for 1-2 antibiotics against clinical bacterial pathogens was developed. Accurate determination of the minimum and fractional inhibitory concentrations of vancomycin, gentamicin, and linezolid were determined by assaying growth of two clinical methicillin-resistant *Staphylococcus aureus* isolates via a colorimetric assay on-chip.

(c) cardiovascular biomarkers [3]

We developed a pneumatically-driven, automatic integrated microfluidic platform for the simultaneous detection of NT-proBNP up to six clinical samples within 25 min by using a novel aptamer-based sandwich assay, and the limit of detection was only 1.53 pg/mL;

(d) artificial antibodies (aptamers) for bacterial detection [4]

An integrated microfluidic device for *Acinetobacter baumannii* (*AB*) diagnosis utilizing a new dual aptamer assay was developed for point-of-care (POC) applications; magnetic beads coated with *AB*-specific aptamers were used to capture bacteria, and quantum dots (QD) bound to a second aptamer were utilized to quantify the amount of bacteria with a light-emitting diode (LED)-induced fluorescence module integrated into the device.

References

[1] Yu-Dong Ma et al., Sensors and Actuators B: Chemical, DOI: 10.1016/j.snb.2019.126647, 2019.

[2] Wen-Bin Lee et. al., Lab on a chip, DOI: 10.1039/C9LC00585D, 2019.

[3] Anirban Sinha et. Al., Lab on a chip, DOI: 10.1039/C9LC00115H, vol. 19, pp. 1676-1685, 2019

[4] Chih-Hung Wang et. al., Sensors and Actuators B: Chemical, vol. 284, pp. 395-402, 2019.

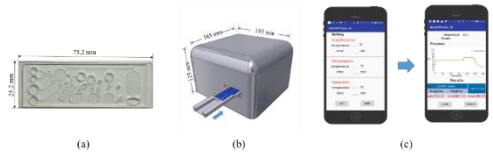

Figure 1: A point-of-care system for fast diagnosis of influenza A [1].

Figure 2: (a) A microfluidic system for automating AST process. (b) A photograph of the microfluidic chip [2].

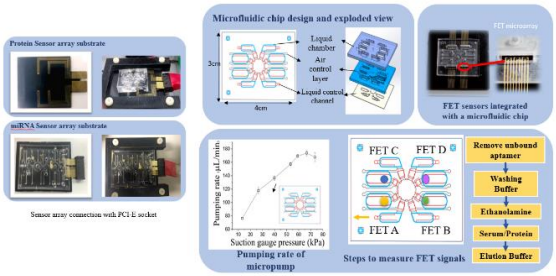

Figure 3 An integrated microfluidic system for fast diagnosis of biomarkers of cardiovascular diseases [3]

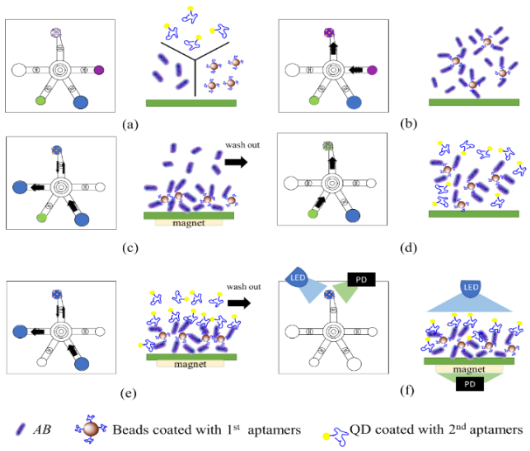

Figure 4 Screening of aptamers for biomedical applications [4].